

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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Alpine Cableway
— Page 81



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Next Month

THIS PRETTY LASS owns just one of the 2,500,000 small boats in this country. She's a lucky lass because she has access to a derrick to launch and retrieve her craft. Not so lucky are most week-end sailors. Outboard boating has hit with such a bang that suddenly there is a genuine traffic jam at the water's edge. Boaters have neither the facilities nor the room to get their craft in and out of the water. This has led to the development of thousands of yacht clubs of a new type. Members are truck drivers, schoolteachers and the man next door. Some of their ingenious boat-handling methods are shown next month

Information not listed on articles in the index, starting on page 74, frequently is listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge. A copy may be obtained by writing to the Bureau of Information, Popular Mechanics, 200 E. Ontario, Chicago 11, Ill.

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In This Issue...

Cableway to the Top of the Alps	81
Seabees Build a Town Under Antarctic Ice	89
Disaster Clinic	96
Owners Report on the '56 Cadillac	104
Target: Satellite Europe	110
Now You're Cooking With the Sun	114
What's New for Your Home	122
Here's Fun From My Bag of Camera Tricks	126
Radio, TV and Electronics	161

Outdoor-Living Section—

Get Ready for Outdoor Living	145
Eight Patios You Can Build Yourself	146
Light Up the Outdoors	149
Keep Cool in a Screen House	145
Do You Have a Landscape Problem?	170

(plus many other ideas for your outdoor comfort)

For the Craftsman...

Time to Build a Clockcase—Part I	173
Modernize Your Home With Practical Built-Ins	186
Use Engine for Your Power Mower for Other Jobs	194
Keep Your Outboard Humming	201
Build Your Own Belt Sander	205
Know Your Shop Motors—Part I	209
Shopping for Tools	218
Clinic for Homemakers	224

See pages 74, 76 and 78

for other items and manufacturers of available products



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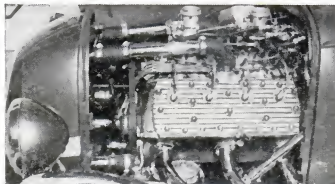
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**ACROSS THE
DESK**



To the Editor:

In your February issue ("Seattle Police Patrol an Underwater Beat") you made a statement that "Patrolman Theodore Yerebek, equipped with oxygen tank and rubber suit, prepares to go below." Oxygen when used under pressure will become a deadly poison as the pressure increases, such as when it is used in the aqualung or other self-contained breathing equipment . . . Tanks are filled with compressed air only.

Joe Vogel,
2618 N. College Ave.,
Indianapolis, Ind.

We stand corrected.

Sports Cars on Display

At the same moment that you were receiving your February issues with the eight pages of beautiful paintings of famous sports cars, the originals of those paintings by Paul Hamlin went on display before 700 members of the Sports Car Club of America, in convention at Detroit. Naturally we



were gratified at the enthusiastic reception they received. Many extra sets of the printed color section were ordered by the sports-car fans, and a few are still available to those interested. Readers will receive prints of the paintings suitable for framing if they send 25 cents for the set of eight to our Bureau of Information, 200 E. Ontario St., Chicago 11.

Prize PM Authors

Our Book Department is bursting with pride. Two authors of PM books have won prize awards from the Thomas Alva Edison Foundation. In December 1955, one of the

(Continued to page 8)

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APRIL 1956

(Continued from page 6)

awards went to Don Herbert as producer of the best children's science-TV program and author of *Mr. Wizard's Science Secrets*, published by Popular Mechanics Press.

In February 1956, John Lewellen's book *The Boy Scientist*, also published by *PM*, brought him a beautiful scroll and check for \$250 as the best children's science book published in 1955. The Foundation's awards were presented by the Honorable Charles Edison, son of Thomas A. Edison.

Teachers Wanted

In a land of plenty there are still critical shortages. Notably there is a shortage of engineers and, along with that shortage, there is a growing need for teachers—the teachers who help produce the engineers.

Dr. Jess H. Davis, president of Stevens Institute of Technology at Hoboken, N. J., reported recently that Soviet Russia last year graduated 53,000 engineers—the United States only 22,500. If America is to keep its leadership, he pointed out, engineering colleges will have to concentrate on teaching engineering science—improving the undergraduate's understanding of the theoretical concepts" of that science—leaving it to industry to handle the "how to do it" technical instruction in particular fields.

The shortage of science teachers is exemplified in a letter received by *PM* recently from Monroe M. Freedman, administrative assistant at Samuel Gompers Vocational and Technical High School, New York City. He reported the New York schools "in urgent need of radio, communications and television instructors" and, as a licensed amateur-radio operator, appealed to fellow amateurs and technical men to become electronics teachers. Qualifications for such teaching opportunities are high-school graduation and five to seven years of trade experience, with maximum age of 60 years; the salary range is from \$3900 to \$7600.

To the Editor:

As a member of the sports-car cult, as you call it, I was especially glad to see your sports-car section in the February issue of *PM*. The portraits of 10 leading sports cars were masterfully done by Artist Hamlin, although there are two errors, one by the caption writer, concerning the portraits.

First of all, the Jaguar shown was not an XK140 model, but the earlier Jaguar model, the XK120. The other error concerns the Ferrari 70 Monza portrait. Ferrari factory literature lists the Monza as being

(Continued to page 10)

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If your answer is "yes," success is right around the corner. But if the answer is "no," then your experience doesn't amount to much. And chances are these things are true about you: you just "coast" along with things . . . you do nothing and go

home all tired out. BEWARE! Those are danger signals. Unless you take a fresh look at things, you'll be doing the same job at the same salary for the next five years. And the next five.

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(Continued from page 8)

available only with right-hand drive, not left-hand drive as the artist pictured.

These errors are very small, but I thought that you might interested in correcting them. As I said before, the portraits are very good and the errors don't detract from their excellence.

Your auto section was exceptionally good this year. Keep up the good work in bringing reports on automobiles up-to-date!

An Enthusiast,
Tim Ennor,
434 Washington St.,
Reno, Nevada

Mr. Ennor is correct, and we regret the errors.

☆☆☆

Other comments on the February automobile section:

I enjoyed your articles on sports cars. I own one of these magnificent "animals," and I can say that truer words were never spoken.

Dick Cook,
Lakewood, Ohio

☆☆☆

Enclosed please find 25c to cover cost of mailing these (sports car) pictures. I'm a schoolteacher and would like to use them for classroom display.

Robert Finch,
San Diego, Calif.

☆☆☆

I found the survey "Why Do People Buy the Cars They Buy" very interesting and I think it ought to provide conversation around the industry for some time to come.

Harry A. Williams,
Public Relations Director,
Automobile Manufacturers Association,
Detroit, Mich.

☆☆☆

Would like to give you my definition of a sports car: "Like my own right arm."

Donne Alves,
Santa Cruz, Calif.

☆☆☆

It is good to see that a magazine other than a regular sports-car magazine gives these cars the recognition they deserve.

Edmond F. Gormel, Jr.,
Nunda, N. Y.

☆☆☆

Would like to have the paintings of the 10 sports cars. We will be moving into our new house shortly so I would like to frame the paintings for my room. None of the other magazines ever show the specifications of the new cars and the wallet-sized

(Continued to page 14)



I WILL TRAIN YOU AT HOME FOR GOOD PAY JOBS IN RADIO-TELEVISION

J. E. SMITH has trained more men for Radio-Television than any other man. OUR 40th YEAR.

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"Started to repair sets six months after enrolling. Earned \$12 to \$15 a week in spare time."—Adam Kramlik, Jr., Sunnyside, Pennsylvania.



"Up to our necks in Radio-Television work. Four other NRI men work here. Am happy with my work."—Glen Peterson, Bradford, Ont., Canada.



"Am doing Radio and Television Servicing full time. Now have my own shop. I owe my success to N.R.I."—Curtis Stath, Ft. Madison, Iowa.



"Am with WCOB. NRI course can't be beat. No trouble passing 1st class Radio-telephone license exam."—Jesse W. Parker, Meridian, Mississippi.



"By the time I graduated I had paid for my course, a car and testing equipment. Can service toughest jobs."—E. J. Streitenberger, New Boston, Ohio.

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UNDER G. I. BILLS**

You Learn by Practicing with Parts I Send



Nothing takes the place of PRACTICAL EXPERIENCE. That's why NRI training is based on LEARNING BY DOING. You use parts I furnish to build many circuits common to Radio and Television. As part of my Communications Course, you build many circuits, including low power transmitter shown at left. You put it "on the air," perform procedures required of broadcast operators.

My Servicing Course you build modern Radio, etc.; use Multimeter you build to make money fixing sets in spare time while training. You can stay at home, keep your job, learn Radio-TV in spare time at low cost. Mail coupon for book showing other equipment you build and keep.

**The Tested Way
To Better Pay!**

Training plus opportunity is the PERFECT COMBINATION for job security, good pay, advancement. In good times, the trained man makes the BETTER PAY, GETS PROMOTED. When jobs are scarce, the trained man enjoys GREATER SECURITY. NRI training can help assure you more of the better things of life.

**Start Soon to Make \$10, \$15
a Week Extra Fixing Sets**

Keep your job while training. I start sending you special booklets the day you enroll that show you how to fix sets. Multimeter built with parts I send helps you make \$10, \$15 a week extra fixing sets while training. Many start their own Radio-Television business with spare time earnings.

My Training Is Up-To-Date

You benefit by my 40 years' experience training men at home. Well illustrated lessons give you basic principles you need. Skillfully developed kits of parts I send (see below) "bring to life" things you learn from lessons.

**2 FREE BOOKS
SHOW HOW
MAIL COUPON**



Television Making Good Jobs, Prosperity—Even without Television, Radio is bigger than ever. 115 million home and auto Radios are big market for servicing. 3000 broadcasting stations use operators, technicians. Government, Aviation, Police, Ship, Micro-wave Relay, Two-way Radio Communications for buses, taxis, trucks, R. R. are growing fields. Television is moving ahead fast.



About 200 Television stations are now on the air. Hundreds of others being built. Good TV jobs opening up for Technicians, Operators, etc.

25 million homes now have Television sets. Thousands more are being sold every week. Get a job or have your own business selling, installing, servicing.

Radio-TV Needs Men of Action—Mail Coupon Without obligating you in any way, I'll send an actual lesson to prove that my training is practical, thorough; 64-page book to show good job opportunities for you in Radio-TV. Terms for NRI training are as low as \$5 a month. Many graduates make more in two weeks than total cost of training. Mail coupon now. J. E. SMITH, President, National Radio Institute, Dept. 6DA, Washington 9, D. C. OUR 40TH YEAR.

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Quick—Easy—Convenient To Use!
Just Dab On Your Favorite Bait,
Drop In Water And Fish As Usual!

Are you down on your fishing luck? Have you been coming home recently with an empty creel? Have you invested hard earned cash on the latest fishing tackle, fancy lures and bait—only to be frustrated time after time? No matter how unlucky you've been, this new discovery may change all that—quickly! Now, at last, you too can use a secret that professionals have tried with astounding results—a secret that even a schoolboy can use to catch more fish, no matter what the weather, bait or tackle. You can even get big ones out of what the misinformed call "fished-out" waters. And you can do it with your present fishing methods and equipment! No need for special bait . . . whether you fish in a river, lake, pond or the open sea . . . whether you cast, spin, troll or do still-fishing . . . this new discovery will give you the thrill of your life!

SCIENTISTS DISCOVER STRANGE HABITS OF SEA LIFE

Man has been fishing since the dawn of time. Yet during countless centuries he's never really known much about sea life. Then leading scientists from all over the world got on the job, including the U. S. Dept. of Fisheries. Ichthyologists, chemists, zoologists and sportsmen joined in the quest. Millions of dollars were spent on gigantic glass aquariums, sub-marine cameras, recording devices and lab equipment. In less than a generation man learned more about the mysteries of sea life than in the previous 10,000 years.

EXPERIMENTS PROVE FISH ARE ALMOST BLIND

Here is the most startling discovery that the scientists unearthed: most fish—of ALL species—have very poor eyesight compared to birds and mammals. Some are almost blind! No wonder, then, that you can use the most attractive dry lures—yet go home after a day's fishing excursion with little to show for it but a sunburn!

It doesn't make much difference how good the bait is to you, nor how hungry a fish may be—if he doesn't SEE it, if he isn't DRAWN to it, you won't get a nibble! And test after test proved that unless you get the lure right under the fish's nose, you simply cannot attract him to your hook!

NEW SEX-HUNGER FISH LURE DEVELOPED BY GERMAN CHEMIST

The new Lurene formula was developed by a German chemist, a graduate of the University of Tübingen in Württemberg, Germany. An acknowledged leader in his profession, he knew that certain lures and bait failed simply because many fish were nearly blind. But he learned that Mother Nature in her bounty provided fish with extra powerful sense-instincts that led them irresistibly to their food supply.

FAMOUS SPORTS EDITOR PRAISES LURENE FORMULA

Millions of readers follow Walter S. Miller's sports column, "Rod, Gun & LENS," which appears in over 15 metropolitan newspapers.

He tests new products thoroughly, warning readers against shoddy, defective articles but also giving praise where praise is due. This is what this great sports authority says about LURENE:



TEST IT YOURSELF THIS EASY WAY!

No elaborate equipment required! An ordinary glass aquarium tank and ANY species of fish will prove this new method really works! Drop in 2 or 3 lines with your favorite bait. Treat only ONE with the new LURENE "triple-instant" preparation. It's the same bait . . . the same lures . . . yet right there before your eyes you'll be witnessing a fascinating spectacle! You'll hardly believe your eyes! The fish, as compelled by some unknown power are drawn to the Lurene-treated line. This article explains how this "triple-instant" in fish can increase your fishing luck.

This sense-instinct for want of a better name may be called Smell-Taste. In other words, a fish both SMELLS and TASTES at one and the same time. For this purpose, the bodies of fish are covered with thousands upon thousands of tiny smell organs without which life would be impossible. Armed with this knowledge, the eminent chemist finally developed the now famous Lurene formula.

NOW—SEX FACTOR ADDS EXTRA "PUNCH"

Scientists have long known that the sex factor is one of the most compelling instincts in sea life. Fish go to fantastic lengths to fertilize their eggs. They travel countless miles to fertilize them—go through incredible torture, accomplish almost impossible tasks. One of the most wondrous sights of nature is to watch male salmon struggle up river fish-ladders to fertilize the spawn. NOW—for the first time ever—natural sex hormones have been added to the new Lurene formula. This has increased production costs considerably—but you'll agree after using it that it's certainly worth it. And it's SO easy to use—just dab a little on the plug or bait, drop it in the water and fish as usual. LURENE works in lakes, streams, ponds or in the ocean. It makes no difference if you still-fish, troll, cast or spin. Lurene disperses in the water, giving

you greater penetration, longer range and far more attraction power.

RESULTS GUARANTEED OR IT DOESN'T COST YOU 1c

Now you can try Lurene at our risk! It must help you catch more fish—faster! Lurene must prove to be the best scent lure you've ever used or your money back! You're invited to try it without obligation. We want you to see for yourself how Lurene releases its deep, penetrating "call" into the surrounding waters. See how the mysterious instincts of the sea world help attract fish to your hook. And—of this you can be sure: Lurene really works—it positively helps draw 'em in! So we say: try it and judge for yourself. See if you don't get the big ones—even in "fished-out" waters! Use it to pull in your favorites—trout, pickerel, catfish, blues, weaks, pike, perch, bass, snappers, porgies. You need spend no money now. Simply deposit 1.98 plus postage with your mailman when the Lurene arrives—or mail 1.98 now for immediate prepaid shipment. But please remember: you're trying—not buying! Unless you're satisfied in every way with this new, different product, it won't cost you a penny, rush the coupon now while supplies are available to:

LURENE CO., Dept. 6-D-10

352 Fourth Ave., New York 10, N. Y.

Change Your Fishing Luck—Mail Coupon Today!

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Rush—1.98 packages of Lurene on 5-day Free Trial. It is guaranteed—the formula must help me catch more fish. It must give me thrilling results. Otherwise, you will refund my 1.98—no questions asked.

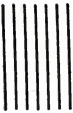
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Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

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You need proper equipment to service today's automatic appliances. With *this* course you get parts to build professional type, multi-use Appliance Tester. You learn to use it. Takes guess work out of servicing. Mail coupon for FREE book and Sample Lesson. See how easy it is to learn. Find out about NRI—a school that for more than 40 years has been training men, through home study, for success, good pay jobs. Our reputation, record, experience back up this course. Write now to: Electric Appliance Training, NRI, Dept. AD6, Washington 9, D. C.



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(Continued from page 10)

insert of the specifications in your February issue is just the thing for proving an argument:

Paul DeVelder,
Canton, Ohio

☆☆☆

I always look forward to your "auto issue" with much eagerness, and this year I think you have outdone your own standards; this one is the greatest yet. Keep up the good work.

Truman W. Abbott,
Lakeland, Fla.

☆☆☆

As an avid sports-car fan, I think the current article is one of the best I have seen for a long time.

Barry E. Noice,
Woodstock, Ontario, Can.

☆☆☆

I greatly enjoyed your auto section in February . . . looking forward to next year's review.

Richard Walsh,
Englewood, N. J.

☆☆☆

. . . exquisite article, "Sports Cars of the World," in the February issue.

Rob Muir,
Maryville, Tenn.

To the Editor:

Currently much is being written about safety features in the 1956 cars. While safety is important to all of us, the following is equally important: The matter of designing and building cars for more economical maintenance. Just about every car owner has had the aggravating experience of repeated expense in having many little factory-built defects repaired, mainly because the car makers did not see fit to build a little more quality into their cars.

Right now, certain car makers are so wild to outproduce one another that car quality as we know it is getting less and less in some cases. How many readers of *Popular Mechanics* will agree that shoddy workmanship, sloppy assembly methods and lack of adequate assembly inspection are on the increase?

Now is the time for all car owners to put their expensive experience to work by notifying the car makers with repeated reminders that they have a responsibility to us; that in return for the increasing cost of cars we want at least our money's worth in more car quality, noticeably better workmanship and a change from the attitude so

(Continued to page 16)

I saw my job failure in my family's eyes



... but how they smiled when
I. C. S. pulled me through

Take it from me. That's the hard way to discover a mistake.

I thought I was in solid down at the plant with my years of experience. They'd never lay me off.

But they did. And I was in solid—as long as business was good. But when things started getting tight...

"In times like these," the boss told me, "everybody has to pull his own weight and a little more. Experience is more than just adding up years. You have to learn something, too."

I was sore, sure. But when I calmed down I realized he was right. I decided then to start learning. I signed up for an I. C. S. Course, studied at home in my spare time.

Then I went back to the plant. The boss was so impressed with my I. C. S. diploma, he gave me another try... and soon after I even got a raise!

TRAINED men are in demand

It's a fact. Right now there are plenty of job opportunities for trained men. How do you get training and hold down a job at the same time? Simple. Study with I. C. S. at home, in your spare time, at a cost of only pennies a day.

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☐ Refrigeration
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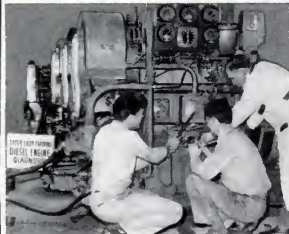
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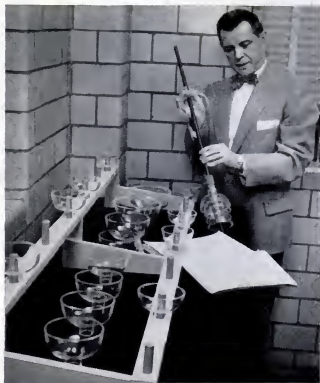
(Continued from page 14)

common among the top management of certain car makers of "what are a few dissatisfied customers lost here and there."

R. Blagden,
Box 42, R.R. 3,
East Hampton, Conn.

Memo to Ben Franklin:

In our January issue we dedicated an article to you, "Ben Franklin—Trail Blazer for Inventors." The occasion, of course, was your 250th birthday. We described one of your inventions, the armonica, a musical



instrument consisting of rotating glass bowls played with moistened fingers.

Now the Corning Glass Works is reproducing the bowls to your exact specifications for the American Academy of Arts and Sciences. They will be assembled into a reproduction of your armonica, and the instrument will be played at a special concert at Cambridge, Mass. Recordings probably will be made so anyone can enjoy the tones which you described as "incomparably sweet."

Just thought you'd want to know about this during your big birthday year.

To the Editor:

Am writing you to let you know that I have an original *Popular Mechanics* which will be 50 years old in July.

Still am a *Popular Mechanics* reader today. Comparing the old with the late editions is amazing.

Newt Stairs,
Greensburg, Pa.

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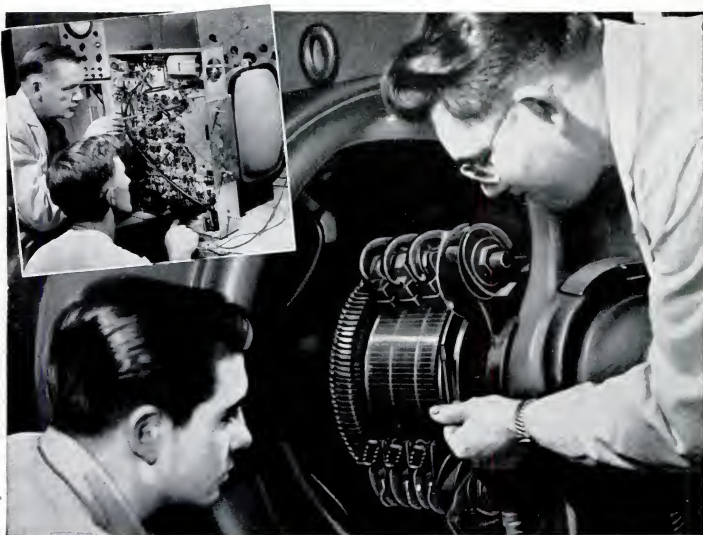
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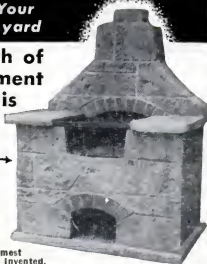


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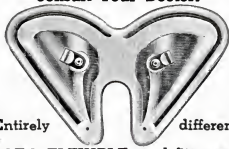
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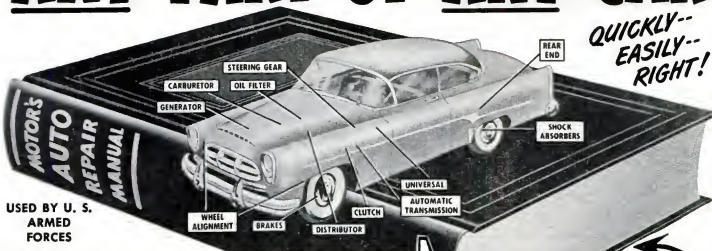
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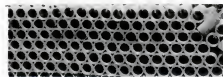
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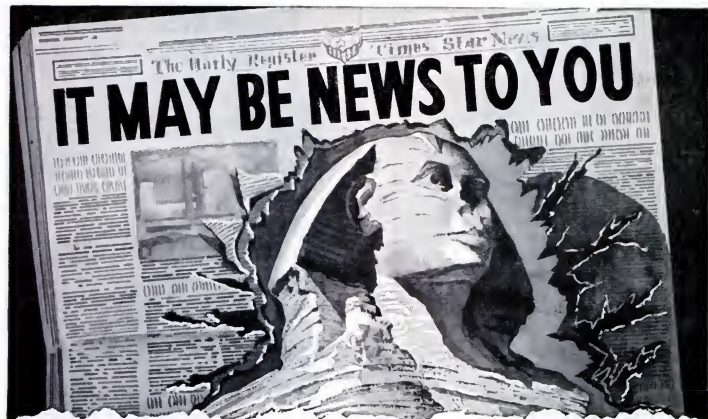
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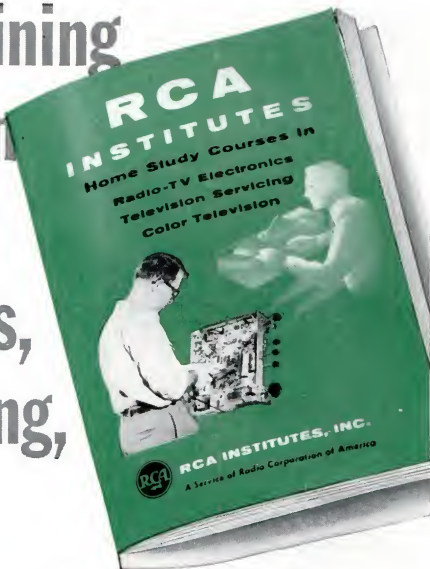
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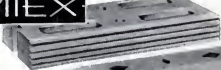
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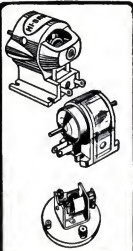
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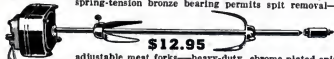
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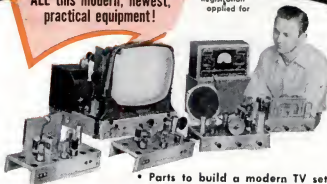
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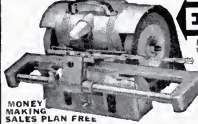


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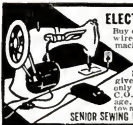
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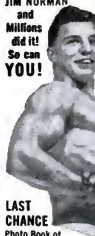


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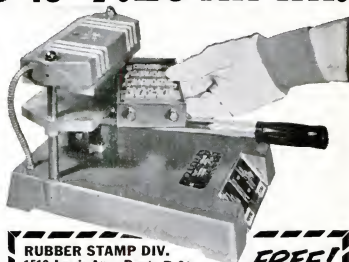
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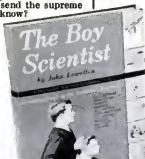
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WHERE-TO-BUY-IT INDEX

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AUTOMOTIVE

Oil cup for batteries stops corrosion (Jano Sales Co., 2946 Los Feliz Blvd., Los Angeles 39, Calif.)	118
Reclining seat fits any car (Coachcraft, Ltd., 9017 Santa Monica, Hollywood, Calif.)	118
Tire "pumped down" with fast deflator (Akro-Mils, Inc., P. O. Box 989, Akron 9A, Ohio)	118
Auto-top sleeping bunk folds into compact package (Gibbons Supply Co., Birmingham, Mich.)	120
Shovel hits 'em . . . and hits 'em (Clark Equip. Co., Constr. Mach. Div., Benton Harbor, Mich.)	135
Plastic cutout alerts drivers	137
Wheels, wheels and more wheels add up to French trailer	141

AVIATION

Aerocycle lifts soldier	88
Synchrophasing of propellers quiets plane-cabin noise (United Aircraft Corp., Windsor Locks, Conn.)	117
Chemical deodorizes air in Swiss transport planes	119
Seat-belt safety release (Pan Avion Co., P. O. Box 213, Miami 48, Fla.)	124
TV camera cuts testing time	134
Swiss P-16 jet for short runways	136

CONSTRUCTION AND INDUSTRY

Sewer-sealing machine patches cracks underground	86
16-story mobile shovel takes 90-ton bites of earth (Marion Power Shovel Co., Marion, Ohio)	95
Giant jungle destroyer clears forested land (R. G. Le Tourneau, Inc., 2399 S. MacArthur, Longview, Tex.)	124
Watery coal mine	132

HOUSE AND HOME

What's New for Your Home—	
Air cleaner uses electronic filter	122
Dolly fastened to the bottom of garbage can	122
Window lock permits leaving windows open	122
Sliding panels on each side of picture window	123
Wheeled reel for garden hose rolls easily	123
Nutcracker fastens to any table	123
Bath hammock holds baby	123
Outdoor Living—	
Get ready for outdoor living	145
Light up the outdoors	148
Better tables for your patio	150
More than a fence	151
Portable grills for every pocketbook	152
Have fun in your back yard	154
Rolling cupboard for the barbecue	158
Workshop moves outdoors	159

MISCELLANEOUS

Roll-on roll-off ship (Searoad Transport Co., 110 Ocean St., Hyannis, Mass.)	87
Level's floating pointer measures tilt in degrees (Laramie Chemical Corp., 16 Putnam Park, Greenwich, Conn.)	95
Look, Ma—no wires! (Telechron Clock and Timer Dept., General Electric Co., Ashland, Mass.)	102
Meat-cutting guide protects user's fingers	102
Two-power telescopic sight for BB gun (Daisy Mfg. Co., Plymouth, Mich.)	102
Kit permits amateur to bind books and magazines at home (Hewitt Prod., Liberty, N. Y.)	119
"Mechanical stomach" for elevators (Westinghouse Electric Corp., Merchandise Mart, Chicago 54)	120
Antiwind wall protects ships	121
Motor scooters replace horses in Berlin trotting races	121
Pasteurizing eggs	124
TV guards gate	125
Sahara sailboat	134
Farmer's jack-of-all-trades pushes or pulls upward	134

(Continued to page 75)

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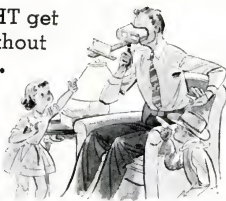


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(Continued from page 74)

Wooden works for grandfather's clock assembled from kit (Corry Clock Co., Corry, Pa.)	135
Over-the-carpet dance floor converts parlor into ballroom (Mueller Dance Floor Co., 530 Sunset Blvd., Los Angeles 27, Calif.)	136
Model railroad wreck	137
Portable paint drier uses infrared coils	141
Magnifier permits focusing on silver grains of negative (Bausch & Lomb Optical Co., Rochester, N. Y.)	141
Electric oil gauge measures well level	144
Watertight zipper	236
Sun shield for air conditioner increases efficiency	244
Sinking town	244
Dictionary stand (L. C. Products Co., Box 188, Elsie, Mich.)	244
Case of mistaken identity in 44-year-old explosion	248

SCIENCE

Ammoniated cigarettes next?	76
Ultraviolet water sterilizer	66
Kitchen of future has glass-dome oven and automatic food mixer	88
Can you cry for science?	102
Hormone makes pale apples blush	116
Atomic-cannon barrel takes 48-foot ramrod	132
Keeping up with the atom	133

Radio-Television, Electronics

TV for trailers	161
Car radio doubles as PA system	162
Electronics and hobbyists	164

Craftsman and Shop Notes Index

FARM AND FARMING

Weather vane indicates wind direction on vertical dial	164
Large portable feedbin built on spreader frame	213
Feed bunk "roofed" on one end to protect mineral and salt	214
Haymow doors counterweighted for easier operation	214

HOUSE AND HOME

Lightweight bathtub seat doubles as "vanity"	179
Air conditioner in living room cools upstairs bedroom	180
Dan the doorstop man	181
"Bookworm" bookends offer novel book display	184
Panels in door replaced with glass to light dark entryway	197

HOUSEHOLD HINTS

Soiled book edges cleaned with fine sandpaper	169
Stop brass tarnish	169
Tape makes waterproof seal between sink and cabinet	172
Tank-type vacuum cleaner defrosts home freezer	172
Wax marproofs furniture casters	181
Yarn sample attached to box identifies contents	192
Paint renews worn linoleum	192
Loose slide fastener repaired	216
Solving Home Problems—	
Ordinary soap applied to bottom of pans eases cleaning	198
Small jars or tumblers won't tip	198
Sandpaper taped to thimble speeds plucking basting threads	198
Coat hanger will support stepladder	198
Clothesline prop won't slide or fall	199
Strips of luminous tape attached to door	199
Buttons that have been sorted kept in order	199
Salt solution will soften hard residue in bottom of pan	199

(Continued to page 78)

IMPORTANT NOTICE—It is the intention of this magazine to provide its readers with information regarding the latest developments in the mechanical arts. We take no responsibility as to whether the disclosures contained in our articles are covered by patents and advise readers to investigate this subject before making, using, or selling any of the products, machines, or processes described in order to avoid possible liability for patent infringements.

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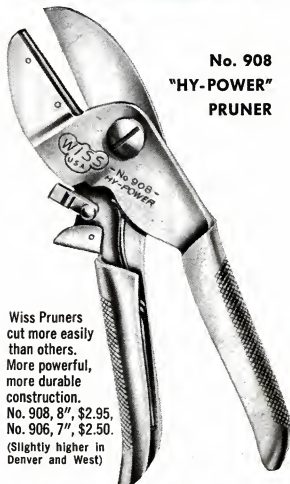
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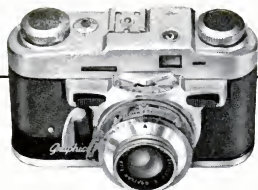


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(Continued from page 78)

MISCELLANEOUS

Foil shields corsage pin.....	169
Painting ship's water line.....	169
Simple table for sickroom slides on bedrails.....	169
Block of insulation board holds fishhooks safely.....	172
Stove clock fitted in box used as darkroom timer.....	172
Small holes punched in paper bags foil noisemaking urge.....	179
Date stamp cleaned in solution of dilute ammonia water.....	181
Positive steering "gear" for coaster wagon.....	181
Paper cups and tape support sales cards.....	184
Vacuum fitting cleans camera.....	185
Mirror "stitched" on tent wall is convenient for shaving.....	192
Rough gems embedded in plaster easily held while cutting.....	192
Coat-hanger "clamps" hold cover on car seat.....	197
Turn buttons on tent pole hold fishline for quick drying.....	200
Upturned brush is soap dish.....	213
Reflective tape on headlights eliminates "one eyed" hazard.....	216

TOOLS

Bolt turned in threaded tubing prevents drill-bit breakage.....	208
Wrench for socket-head screws improvised from file tang.....	208
Proportional dividers.....	217
Shopping for Tools—	
Masonry drill for cooling diamond drill bit.....	218
Hack saw with special frame.....	218
Bench-leg bracket holds angle-steel legs.....	218
File guide is aid in sharpening circular-saw blades.....	219
Self-ejecting chuck key.....	219
Center-point locator eliminates guesswork.....	219
Soft hammer comes equipped with interchangeable heads.....	219
Sawhorse made from steel tubing.....	219
Tap-chaser holder.....	220
Variable-speed driver for wood screws.....	220
Dry lubricant comes in a squeeze-type dispenser.....	220

WORKSHOP HINTS

"Self supporting" paintbrush keeps paint off surface.....	172
Rubber grips table-saw blade when touching-up with file.....	179
Tools kept within easy reach on improvised stringer.....	179
Determining approximate speed of slowly rotating object.....	180
Legs for modern furniture.....	184
Bevel on butter trim boards assures tight-fitting joints.....	185
Knockdown shelves.....	185
Rigid workbench joint.....	185
Burrs removed from new keys to protect pockets.....	192
Straightedge is "skidproofed" to minimize glass breakage.....	193
Lawn-mower roller lubricated by saturated felt disks.....	197
Match holder to light gas pilot made from alligator clip.....	200
Paint can has job-data label.....	200
Paraffin lubricates screws.....	200
Wooden plaster trowel.....	200
Pedal-driven miniature tractor has V-belt "transmission".....	204
Screen strip used as compass.....	204
Air cleaner on electric motor.....	208
Cellulose tape holds gasket when assembling engine.....	208
Aluminum tile infuser used as small-parts washer.....	208
"Backstop" on drill-press table prevents work from turning.....	213
Soapy water softens stiff rope.....	213
Case mounted on shop wall stores safety glasses.....	217

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POPULAR MECHANICS

APRIL
1956

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 105 NO. 4

In test run, cabin car nears midway station with two miles more to go to summit of 12,600-foot Alpine peak

VISITORS TO THE ALPS can now ride a cable car above the clouds on a breath-taking climb to within 3600 feet of the highest summit in Europe. More than 100 men worked for five summers to build the cableway into this region of eternal ice and snow where winds can rage at 75 miles per hour, crumpling scaffoldings like matchsticks. The cost was 10 lives and \$1,000,000.

The funicular cableway starts in the village of Chamonix and extends to 12,600-foot-high Aiguille de Midi (Needle of Noon) with a midway station at 6900-foot Plan des Aiguilles. There are two jagged peaks at the summit of Aiguille de Midi: North Point and a slightly higher South Point. A mountain station and hotel were built on North Point. The cableway passes through a shaft dynamited through the rock of North Point, across a steel bridge over a precipice to South Point and through another tunnel to the far side of this peak. There, spread before the visitors, is the snowy panorama of Vallee Blanche (White Valley) where skiing can be enjoyed 12 months of the year.

The men who built the cableway, mostly Italians from the

Cableway to the Top of the Alps

Car approaches North Point of Aiguille de Midi (with hotel).
Cableway goes through shaft to steel bridge to South Point





Plain of Aosta, are said to be the only workmen in the world who can work at heights of 12,500 feet without becoming giddy. During most of the construction period they slept in sheds at the summit and traveled to various working points by lifts and by steep ladders. Every piece of steel, cement, nail and cogwheel had to be transported by hoists and sleds. Snow or ice had to be melted to obtain water for making concrete during the entire working season from May through the end of October. Sudden and treacherous winds were the greatest hazards encountered by the workmen as they clung to crags overlooking ice chasms. The workers called themselves "spiders of the sky."

The citizens of Chamonix had talked about building a funicular cableway to Aiguille de Midi for more than 50 years. Plans were made to start building as far back as 1905. It was not until August of 1944 that three mountain climbers, Camille Tournier, Jean Morin and Alexis Caux, succeeded in making the first ascent. Aiguille de Midi is part of 15,800-foot Mont Blanc and is situated in the heart of some of the world's most beautiful mountain scenery. When the climbers returned with glowing reports of unsurpassed winter beauty, the funicular project was revived and a private company was formed to finance the project.

The first leg of the project to the intermediate station at Plan des Aiguilles was completed in 1954. The summit, Aiguille de Midi, is two miles from this point and 5000 feet higher. The two-inch-thick double line of steel cable that now links these points and extends to Chamonix weighs 174 tons. Electric motors for operating the cable cars are located at the intermediate station.

The two cars, each carrying 40 persons, travel from Chamonix to the intermediate station in about eight minutes and from there to the summit in sixteen minutes—about 23 minutes for a one-way trip. The cars travel a little over 16 miles per hour from the village to the intermediate station and

Route of world's highest cableway starts at Chamonix, climbs to intermediate station and then to summit above timberline



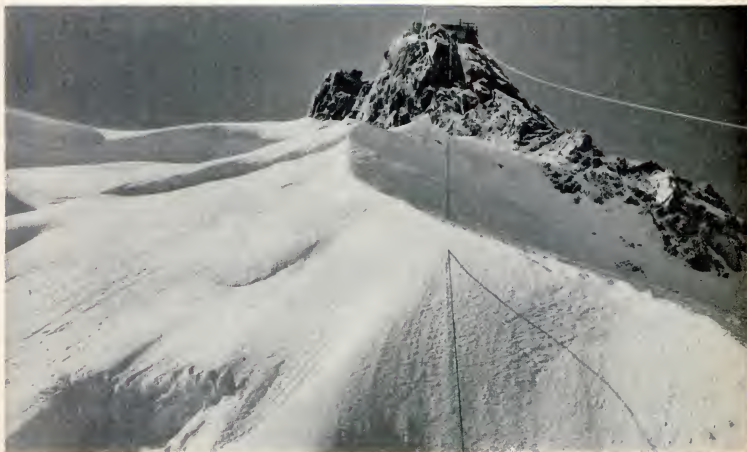
"Spiders of the Sky" traveled to work points on lifts over icy chasms. Ten men lost their lives on project

about 7 miles per hour from there to the summit. Passengers have a choice of making a quick trip up and back, spending a day at the top, or staying over night in the well-equipped hotel on North Point.

Visitors to Aiguille de Midi, including

ski enthusiasts from all over the world, predict that Vallee Blanche will become the world's most famous summer skiing resort. In winter, there are skiing tracks all the way down to Chamonix. One of these, from Col du Midi (altitude 11,500 feet), is

This picture was taken during midsummer while workmen were building mountain station on Aiguille de Midi





Men worked on edge of precipice to blast tunnel through peak so tourists can view valley on other side

Crude ladders and trolley tracks were used by the workmen to move materials. They slept in the shed



11 miles long. Another track leads over the Mer de Glace which has been called the most beautiful glacier in Europe.

Plans are already being made to build another cableway from the South Point of Aiguille de Midi to the Vallee Blanche so skiers can travel quickly and comfortably to this year-round ski paradise.

Chamonix, long a favorite winter and summer resort and the scene of Olympic winter games in the past, has renewed its claim to fame with the new cableway which is the highest in the world. The view from the cable route can be duplicated only from a plane.

As thousands of visitors ride the comfortable cabin cars and look down on magnificent mountain landscape, they will also see (unless they are buried in snow) 10 wooden crosses. They were erected by the sturdy workmen from the Plain of Aosta as a memorial to their friends who gave their lives that others may enjoy the beauty of the peaks and glaciers, the snow fields and icy crags they conquered. ★ ★ ★

DETROIT HAS A billion-dollar secret that it's not anxious to discuss! It's the billion dollars' worth of new tooling for the 1957 cars—the most expensive re-tooling in automobile history.

Tool-and-die shops are working overtime (and have been for months) to provide the tools required for 1957's all-new bodies.

It's not considered cricket to discuss next year's models in April—the middle of the spring selling season. For an obvious reason: The job at hand is to sell 1956 cars—and sales are not exactly booming!

The industry has put itself in a trap. With a two-year styling cycle, it is having trouble convincing customers to buy at the tail end of the run. The customer asks himself: Why not wait?

Reports that the 1957 cars will be out earlier is another topic not freely discussed. This, too, might encourage buyers to hesitate and hesitancy is not a desirable trait when inventories are high (they are highest in history at this moment—over three times last March's figure).

Yet it is likely that 1957 cars will be out by December 1. That date explains the frantic activity in tool-and-die shops. Moving up a month or two in a two-year cycle is ulcer-causing.

Gossip is that Chrysler plans some sort of a big shindig around November 30—perhaps something to compete with General Motors' Motorama. All Chrysler cars must be out by then. When you consider that there are five divisions (all with new bodies) you can imagine what's involved.

Good Buy in Spring

It's a fact, though, that there are valid economic reasons for buying in the spring, not even taking into account the irresistible urge to drive through fresh green countryside in a shiny new car. Customers generally find dealers more discount-minded when inventories bulk heavily and the slow selling days of summer loom ahead.

This year many companies agreed to pay more of the cost of preparing cars for delivery. That should mean you'll get your new car in better shape than you did when dealers footed the bill.

Manufacturers are now giving dealers the equivalent of a price cut in more liberal rebates and awards for volume sales. An interesting sidelight is that manufacturers pay an extra bonus if the customer trades in a competitive car—dealers get richer selling to the "switcher"!

While it may not be cricket, here are some guesses about the 1957 cars. They will be lower in height if not in price. By now you know that 14-inch tires will be standard. But the lower roof line won't be due entirely to the smaller wheels (outside

Detroit Listening Post



By Leo Donovan

tire diameters will be only slightly less). Interior space will have to shrink, especially headroom. If you're having trouble wearing a hat in your present car, wait 'til next year!

Hood lines and trunk lids will be lower, fenders will be higher. On a few cars you may see doors extending into the roof and "receding hairline" windshields that curve upward into the roof. (This could revive the postwar sunshade craze!)

Four Headlights

Cars are expected to wear four headlights. Only two of them will burn at a time. One pair will provide the high beam, the other pair the low beam. The industry can design more and better controlled light into lamps when it doesn't have to compromise by putting high and low filaments in one bulb.

Rumors of new suspensions are current, possibly the air-oil type pioneered by the French Citroen. Nonslip differentials (introduced by Packard) may appear on other cars. At least one car is rumored to have a rear-axle-mounted transmission. Fuel injection? A possibility, but no more than that. It's even more expensive than four-barrel carburetors and companies are not anxious for higher costs.

In April, American Motors will deliver cars with its new V8 engine. It will be the smallest V8 in the industry, making it around 250 cubic inches. Horsepower is 190 with a two-barrel carburetor.

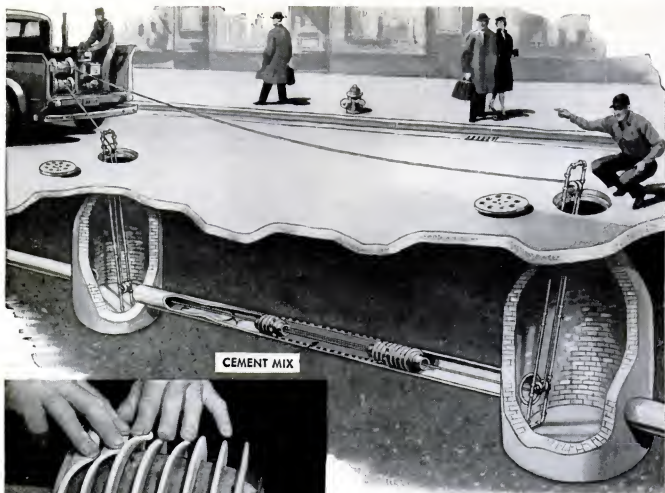
DAYTONA SPEED RUNS

Fastest speeds at Daytona Beach over the two-way flying mile by makes:

(Figures are miles per hour)

Corvette 145.543	Buick 119.403
Chrysler 300B 139.373	Ford 118.130
Thunderbird 134.404	Pontiac 116.618
Dodge D-500 130.577	Cadillac 113.636
Mercury 124.503	Chrysler N. Y. 113.475
Stude. G. Hawk 122.407	Chrysler Wind. 113.386
Chevrolet 121.335	Buick Cent. 111.645

Several Chevrolets were disqualified earlier for running without fan belts after hitting well over 130 m.p.h.



Two Oregon men who had never before so much as looked into a manhole have invented a machine to apply a special cement mixture to seal leaky sewers without the necessity of digging them up. As the sealing machine is drawn through the sewer line by heavy steel cables, a new cement-mix lining is applied to the pipe. Plastic

sewer sealer uses about 300 pounds of cement to repair 400 feet of eight-inch sewer. Inventors say it can be used on pipe up to 24 inches in dia. Rings on sealer are made of special long-wearing plastic

Sewer-Sealing Machine Patches Cracks Underground

disks on the machine force the cement under heavy pressure into all cracks, joints and other faults. Until now, no cement would stick to the inside of an old sewer, but this has been overcome by the addition of a special chemical. A device also has been designed to seal off laterals connecting to the sewer during repairs.



Ultraviolet Water Sterilizer Does Not Affect Taste

Water for drinking or laboratory use is sterilized by ultraviolet rays in a German-made unit. When water enters the sterilization unit, an ultraviolet lamp switches on automatically. After about two minutes, the irradiated water drains off through a spill pipe. The apparatus has a capacity of 33 gallons per hour. An advantage of this type of sterilization is that it does not add a foreign taste or smell to the water.

☐ In 1955, more than 80,000,000 tons of goods were hauled on the Mississippi River.



Stubby, clumsy-looking craft is designed from keel up to carry freight trucks. Skipper pilots her from "penthouse"

Roll-On Roll-Off Ship

PIGGYBACK FREIGHT, in which loaded semi-trailers are carried aboard railroad flatcars, now has gone to sea in a new version. The *Searoad* is believed to be the first vessel ever designed specifically to haul loaded freight trucks. She plies the water between Nantucket Island and Hyannis, Mass. At Hyannis she backs up to the dock, her tail gate is lowered and loaded trailers roll aboard. Her basic load is three 30-foot road trailers, one carried forward and two side by side at the stern. At the other end of the sea route, tractor units hitch onto the trailers and haul them away.



Above right, *Searoad* fights her way through ice as thick as 12 inches. Her bow is specially built to crush ice. Below, tail gate is winched down and loaded truck rolls aboard. Craft can carry three loaded semitrailers





U.S. Army photo

Aerocycle Lifts Soldier

Infantrymen may someday fly into combat on one-man helicopters called Aerocycles. The Army is planning tactical tests of the little flying machines. The pilot stands on a platform over the rotor blades and guides by leaning in the direction he wants to go. Tests show that inexperienced men can become proficient operators after only 20 minutes of instruction. The 200-pound Aerocycle has an estimated maximum speed of 65 miles per hour.

Kitchen of Future Has Glass-Dome Oven and Automatic Food Mixer

Like the dream cars of the motor manufacturers, a dream kitchen unveiled by Frigidaire has a host of startling features—and you won't be able to buy it for a long time. The oven is housed in a big glass dome to let you see what's cooking. Surface cooking is done on a marble counter top with induction heating units below that speedily cook food but don't warm the marble. A punched recipe card fed into an IBM unit controls the measuring and dispensing of the right ingredients. Dishes are washed in three minutes by ultrasonic waves. The self-rinsing sink features a warm-air hand drier, power-driven pot scrubber and a control that measures out a given amount of water heated to a desired temperature. A cylindrical refrigerator with rotating shelves can be loaded from inside or outside the house. An upper section stores dry foods. A hands-free, distant-talking

TV telephone features a device that automatically dials any of 50 most frequently called numbers when a button is pressed. It can be set so that, by dialing home, you can start the oven, open or close windows, or perform other operations. A TV tube would show the faces of telephone callers, views of the nursery or front door, or regular TV programs. A motorized serving cart can be moved by remote control.



Glass-dome oven, range that cooks by induction heating without warming its marble top and a refrigerator with revolving shelves are features of kitchen. Uncooled top section of refrigerator stores dry foods. Recipe maker is in center at rear. TV is also feature



Ships moor to "deadmen" frozen in holes at the edge of Antarctica's bay ice, and supplies move off on sleds

UNDER ANTARCTIC ICE

The Seabees Build a Town

By Richard F. Dempewolff

PM's Staff Editor With Operation Deepfreeze

PART I

ANTARCTICA'S first housing boom—one of the toughest construction jobs in history—is under way. For three months I lived with a group of rugged Navy Seabees in what probably are the world's coldest, most unique villages. They are base camps for the United States antarctic participation in the International Geophysical Year, and were built by these men under staggering odds.

I've watched 700 square miles of bay ice, over which their red-flagged supply trails snaked from ships to base sites, break out in vast chunks and drift to sea in 12 howling hours—leaving ships without moorings and crushing the hull of a stout tanker.



"Summer" features of McMurdo Sound air facility are publicized by Seabees on trailside billboard

Refrigerator-walled village at Little America will insulate residents when snow covers it next month





Pressure ridges in ice near Little America made it tough for icebreaker *Glacier* to carve ship parking space

Along with the rest, during antarctic blizzards, I've been isolated out on the snow prairies for days in a wildly flapping tent, where a single Primus stove warmed my scalp to 38 degrees while my boots froze to the snow floor and canned rations turned to bulging tins of solid ice. Twice in that time, rescue parties hit out across the desolation to save victims of downed aircraft. In two "summer" months of hazardous trail breaking, snow roofs of deep crevasses broke through to trap one monstrous tractor and completely swallow two others.

In spite of it all the towns are built. Today, Little America V, main base for the 1956-57 scientific foray, squats on an endless expanse of snow atop 150-foot ice cliffs on the eastern rim of the Ross Barrier. It consists of 18 featureless cubicle buildings inhabited by a population of 76 men. The bright-orange structures line up along "Main Street" (dubbed "Whitney Lane" for boss Seabee Comdr. Herbert F. Whitney) like a double row of huge reefer boxes. Each has refrigerator doors and two skylights for windows.

There's a reason for their boxlike shape.



Even tractors wear snowshoes in Antarctica. This 35-ton prime mover has five-foot-wide steel tracks

Deepfreeze sled trains are biggest ever used in Antarctica, but extra large runners kept them afloat





Snow melter, above left, produces 1000 gallons of drinking water per hour from four scoops of clean snow



Snow-roofed crevasse near McMurdo base trapped 35-ton tractor that had to be winched out carefully

Replacing traditional flags, wire-mesh trail markers guide radar-equipped Weasels across snowy waste

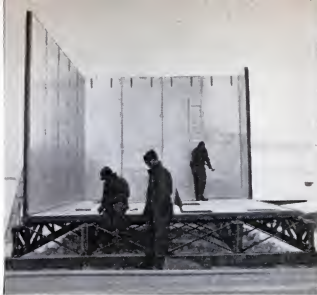


In just another month, frightful storms whirling through the polar night from Antarctica's two-mile-high central plateau will have buried the entire town to the level of its flat roofs. Outside, 100-mile-per-hour winds will howl and temperatures will skid to minus 70° in a land where metal freezes to exposed flesh on contact, kerosene flows like heavy oil and steel becomes brittle as glass. Snug in their warrens, men will move from building to building through a network of shored snow tunnels with wire-mesh ceilings to support the drift.

Everything necessary to life, as well as a wide program of research scheduled for IGY scientists, will be contained in the sub-surface metropolis. Main entrance is via ramp, where tracked snow vehicles rumble down to a heated garage for maintenance and repair. Beside it, inhabitants walk down a main access tunnel stretching off into blue gloom past the chain of interconnected buildings. Big diesel generators in the powerhouse turn out enough electricity to service a village of 250 homes, running a nightmarish array of electronic gear and a radio center capable of voice contact with New York, 12,000 miles away. Towering latrines have built-in overhead snow melters to produce continuous hot

Target markers are picked up on the Weasel's scope, permitting driver to follow trail in any weather





Little America's buildings of prefab panels are erected on snowshoe footings and aluminum beams . . .



Ceiling beams fit into slots in side walls of huts and help to make the entire structure rigid . . .



By slipping and clipping pieces together Seabees erected one 24 by 48-foot building per day . . .



Then moved sleeping bags from frigid tents to insulated floors. Buildings will soon be under snowdrifts

water for showers and laundry. Tunnels branch out to partitioned living quarters, a complete hospital and scientific labs, some resembling Hollywood's idea of something from another world.

Aurora and air-glow scientists won't leave the insulated warmth to observe shifting, colored curtains of the aurora australis during the frigid polar night. From their lab they ascend a ladder through a shaft to a Buck-Rogerish tower above snow level. It sits on stilts, so drifting snow blows under it instead of piling up. Sitting in a heated trunk, men can watch ionospheric lights through a row of plastic viewing domes. Two are for visual work. In the third, an all-sky camera hangs over a convex mirror from which it photographs the entire reflected dome of the night sky. A fourth dome is metal, with sliding hatch through which instrumental readings can be made. Tunnels lead off to rows of labs where cosmic-ray experts, meteorologists,

seismologists, glaciologists and geomagnetists pore over precision instruments measuring the forces that make the world tick. A black, dome-shaped tower jutting up through the snow encloses a big telemetering antenna for tracking weather balloons. Balloons are released through a special hatch from the subsnow inflation center where helium is stored. Through a quarter-mile-long tunnel, inhabitants reach two buried aircraft-repair buildings beside the snow-compacted airstrip.

Living in Little America V will be luxurious by antarctic standards. Every man has 100 square feet of private space, sharing a partitioned cubicle with one roommate. Throw rugs, lamps, easy chairs and inner-spring mattresses make it more like a modern motel than a forward polar base. Bored men can wander to the linoleum-tiled lounge in the separate mess building, listen to music piped by PA system, watch movies or join in recreation programs.



Probing electronic boom on crevasse-detector Weasel locates hidden cracks that booby trap snow vehicles

Once located, crevasses are dynamited and bottom is tested so the chasm can be either filled or bridged



Between buildings men duck through yawning holes along the tunnel to enter storage caves where food, fuel and spare equipment are cached. Supplies are enough to last all inhabitants three years.

"Main Base" is one of five such snow-bound towns being built in Antarctica this year and next by Rear Adm. George Dufek's Task Force 43, logistic spearhead for Operation Deepfreeze under Rear Adm. Richard E. Byrd. Some 375 miles westward, on the other rim of the Ross Sea, tractor-drawn sled trains piloted by bearded men in fur-hooded parkas weave across the bay ice of McMurdo Sound and up black volcanic slopes of Hut Point. Here, on barren ground, 34 curious structures, including a

400,000-gallon fuel farm and ice runway for IGY air operations, are mushrooming above the weathered cabin built by Robert Scott on his first expedition in 1902. Three other subsnow satellite bases—one on the South Pole itself, another 400 miles out in Marie Byrd Land and a third on the unexplored Knox Coast barrier—have been reconnoitered for completion next fall.

Building Town Is Big Job

The job of erecting these insulated polar towns adds up to the most monumental building program ever attempted on the silent continent. The men doing it are a group of specially "winterized" Seabees. Known as MCB (Marine Construction Battalion) Special, the 200-man crew, under Herb Whitney, was hand-picked from 11,000 volunteers. Dressed in insulated thermosuits, they whirled over the snowy barrier in helicopters, scouting building sites. They jounced across wind-drifted snow ridges in Weasels and Snocats, piloted rumbling giant sled trains along flagged trails. Spanning a 20-foot crevasse with a newly designed Bailey Bridge was an evening's work for five of them. The long, beam-shaped sections hook together like pieces of a toy log-cabin kit, and will span up to 100 feet. Tricky buildings shot up at a rate of one a day. At McMurdo air base, Lt. Comdr. Dave Canham, air-operations officer, lived on one to two hours' sleep in 24 as he bounced around volcanic ridges in Jeep or Weasel, doling out jobs to his lieutenants: Jim Bergstrom, GCA officer;

(Continued to page 266)



16-Story Mobile Shovel Takes 90-Ton Bites of Earth

Called "The Mountaineer," the largest shovel ever built here is at work removing 90-ton bites of earth from coal seams in eastern Ohio. Towering 16 stories in the air and weighing 5,500,000 pounds, The Mountaineer is said to be the largest unit of mobile land machinery ever built in

this country. To demonstrate its tremendous lifting power, its builders say the shovel has enough power to lift a platform of 166 automobiles 100 feet in the air, swing them the length of a football field and set them on top of a 10-story building and then swing back—all in 45 seconds.

Level's Floating Pointer Measures Tilt in Degrees

You can measure degrees of tilt with a new level that has the size and appearance of a big ice cube. An air-filled pointer immersed in oil instantly flicks to vertical when the level is tilted. Read from the side, it has two faces, one for degrees and another for feet. Suitable for leveling pictures and furniture, for terracing, roofing and for registering roll and pitch of boat.

¶In a new campaign to eradicate malaria in Mexico, the United Nations Children's Fund in cooperation with the Mexican government is sending 550 crews throughout the country, to spray houses to eliminate the anopheline mosquito.





Investigators work on still-burning engine. Lifelines are used because full gas tank is buried near engine

DISASTER CLINIC

After every air crash the experts of the Civil Aeronautics Board move in, sift every telltale bit of evidence to find the reason why . . . to make sure it will not happen again

By Leonard F. Hiltz

Carrying sacks and forming a skirmish line across the wreckage area, helpers pick up even smallest parts





Surveying company divided wreckage area into 1000 foot areas so a wreckage pattern could be established

AS SHE WASHED the dinner dishes on the evening of Nov. 1, 1955, a farm housewife absently listened to the drone of a plane overhead. Her home was located under a busy airway, and the sound was a familiar, comfortable one. Then suddenly the steady drone was cut off by a thunderous, window-rattling explosion. The woman and her husband rushed out of the house, afraid even to guess what had happened.

There in the deepening shadows of early evening, before their eyes and not half a mile away, a giant airliner plunged into a sugar-beet field. A second explosion split the air and the ground shook under their feet. And above the shattered liner, a brilliant flare floated slowly to earth, its eerie white light making the landscape stark and unreal.

Breaking from the grip of horror, the woman rushed into the house. Her call to the Colorado State Troopers was the first notice that the nation had suffered another major air tragedy—this one more ghastly and bizarre than any before it. The trooper dispatched all available men to the scene, then located a telephone number that state police in all 48 states keep posted in plain sight—the emergency number of the Bureau of Safety Investigation of the Civil

Aeronautics Board in Washington, D. C.

The CAB's safety investigators—18 men spotted at field offices around the country and 27 on constant alert in Washington—are one of the world's most unusual and efficient detective forces. They are the Scotland Yard of American aviation. The techniques they have developed for uncovering the causes of plane crashes have been so effective that of the 70 fatal air accidents in scheduled passenger operations during the past 10 years, only six remain unsolved—and three of these could not be investigated because the planes were swallowed up by the sea.

These men have a twofold job: To find out why an accident occurred, and to see that the cause is eliminated so that others like it can't happen. According to the records, there never has been a repeat accident once the CAB sleuths have found the cause of a fatal crash involving mechanical failure. Because of their findings, aircraft designs have been changed, pilot procedures revised, overhaul and maintenance techniques revamped. Airlines and aircraft manufacturers work closely with the CAB because air-carrier safety is the lifeblood of their business.

The trooper's call from Colorado was



Resting nearly two miles from cabin wreckage, tail section gave first major clue as to accident's cause

switched to the home of William K. Andrews, director of the bureau, who took swift notes and went into action. As he established phone contact with his investigators, more specific details on the accident came in. The plane, a United Air Lines' DC-6B, left Denver and headed north over the flat plateau just east of the Rockies. Near Longmont, Colo., 35 miles north of Denver, it had exploded in mid-air. All 44 of the crew and passengers were dead.

Andrews made one call after another and, after each, another investigator was

Helper notes position of switches on control panel. No evidence of any emergency procedures was found



on the move to the scene. By morning the man designated "Investigator in Charge" had set up CAB headquarters. The other investigators reported to him on arrival and immediately were assigned to investigating teams.

At every crash scene four teams are set up, to study structures, engines and propellers, flight operations and to interview witnesses. These teams work independently of each other and make separate reports. But at coordinating meetings each day they exchange information, and in these conferences the reason for the accident usually becomes apparent. Later a fact-finding panel is convened, at which all reports are reviewed and testimony taken. Testimony and reports are condensed and sent on to the five-man Civil Aeronautics Board, headed by Ross Rizley. The board then issues an official report on the cause of the accident.

When the investigators went to work at Longmont, the press was already speculating on the cause. But even under pressure from the press, the CAB teams work methodically. The interviewing team began a house-to-house survey, talking to everyone along the flight path of the plane. All passengers on the plane at any time in its flight from New York to Denver were queried to learn if they had noticed anything irregular. All witnesses to the accident were interviewed.

Stories often differed in detail, but gradually a pattern emerged. The flight from New York had been uneventful, and the take-off at Denver normal. Observers



Like a giant puzzle, pieces of liner are put back together to confirm investigators' theories. This is section of fuselage containing No. 4 baggage hold



agreed the engines sounded normal in flight. But suddenly there had been a bright flash, followed by an explosion. Then another flash as the emergency flares were set off. The airliner, its engines still roaring, tumbled from the sky. The wings hit in one section of farm land, the tail in another, and the main portion of the fuselage in yet another.

Investigators studied the pattern of the strewn wreckage for clues. A surveying company was called and, using the line of flight as a base, divided the wreckage area—2500 by 10,252 feet—into 1000-foot areas. Close to the main wreckage, the squares were 500 feet. Marked off with rope, the squares were also drawn on a large map. As each piece of debris was identified, it was tagged as to its location in a square, providing an accurate wreckage-distribution chart for study. Army photo planes took aerial pictures of the area.

In the wreckage pattern, CAB men noted wreckage strewn to the left side of the flight path contained parts of the right engine and wing. Wreckage to the right had parts from the left side. The tail section, almost intact, was at the back of the wreckage area, almost two miles from the fuselage. The fact that it had separated from the plane as a whole piece and was so far from the cabin was significant.

Engine specialists determined by examining the engines and propellers that the plane was in a normal, steady climb at the

Interviewer takes a statement from one of first witnesses to reach crash scene. CAB men may talk to witnesses as far as 35 miles from scene for leads





Engine-and-propeller team work in pit containing two engines. Bulldozer was used to help uncover wreckage

time of the explosion. There was no evidence that the pilot had any difficulty or had taken emergency procedures.

CAB investigators learn to read wreckage as the average person reads a book. When trying to determine whether an en-

gine was developing power at the time of impact, for example, they look at the propeller. They judge the blade damage in general, the location of breakage and direction of blade bending, the condition of the blade-angle actuating mechanism, and

Reconstructed heater compartment of DC-6 that crashed at Bryce Canyon in 1947, shows fire damage



Cylinder from Convair 240 developed metal-fatigue crack to cause crash at Fort Leonard Wood, Mo.

the type of terrain or objects struck by the propeller. A general rule of thumb is that blades bent or broken in a forward direction indicate the engine was under power and high r.p.m. Blades broken or bent in the direction of the tail indicate the power was off when the engine hit.

Torn and twisted metal tells a story, too. A fatigue failure in metal leaves a clamshell pattern on the broken end, while a piece breaking under tension is narrowed at the point of break, with a cup-cone formation and a velvety appearance. A shear failure produces a surface that looks like cake sliced with a dull knife.

Investigators are wary of instrument readings, because these may change on impact. The settings of cockpit switches are more reliable, and the parts of the hydraulic system are good indicators of conditions aboard.

Even when a plane has burned, investigators can see whether a fire in flight caused the accident or whether the fire followed impact. And usually they can spot the source of an in-flight fire. Fire leaves smoke streaks. If all streaks are vertical, the fire occurred after impact. Nonvertical streaks indicate an in-flight fire. By following the streaks to their point of origin, an investigator can locate the source of the fire.

At Longmont, structures men found the remains of each wing with its two engines buried in 10-foot holes. The outer portion of each had broken off in descent. The puzzling thing was that the break had been in a downward direction, which could have happened only if the plane were inverted.

Operations men learned that the plane left Denver at 6:52 p.m., 11 minutes prior to the explosion, bound for Seattle, Wash., on a flight plan calling for a cruising altitude of 22,000 feet. The explosion had occurred at 11,000 feet above sea level, about 6000 feet over the ground. Weather had not been a factor. There had been no radio contact with the pilot.

Postal inspectors collected the remains of the plane's mail, and reported that it had scattered over an eight-mile area—unusual even in high wind. They recovered 95 percent of it undamaged. The remaining five percent was ripped to bits, another unusual circumstance.

Early witnesses reported smelling gunpowder around the wreckage, and investigators localized the smell around the aft section of the fuselage. Pieces of the aft section just forward of the tail were gathered up and examined critically. The manner in which they had ripped apart indicated an explosion had taken place inside the Number Four baggage hold.

(Continued to page 238)



Above, switches on copilot's panel are checked. Below, CAB propeller expert examines damaged blades



Every large piece of wreckage is tagged to identify it and to indicate where in the wreckage pattern it was found. Pattern often yields valuable information



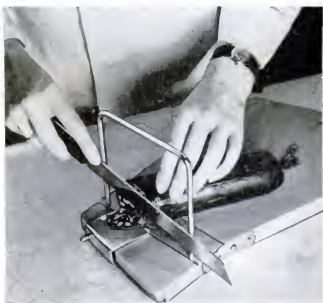


Two-Power Telescopic Sight for BB Gun

Just like a high-powered hunting rifle, a new BB gun has a telescopic sight (left). The two-power scope has a four-lens optical system. The scope also is available alone and can be fitted to most existing air rifles.

Meat-Cutting Guide Protects User's Fingers

Meat and bread can be cut precisely with a cutting guide (right) made in West Germany. A metal standard keeps the knife in place as pressure is applied. A groove in the cutting board helps to guide it. The folding metal standard also protects the fingers of the person using it.



Look, Ma—No Wires!

Electronic impulses picked up from the air synchronize a battery-powered clock. The impulses come from the 60-cycle alternating current of nearby wiring in the building, and are already present in any wired room. A small transmitting pylon may be plugged into a wall outlet to amplify the synchronizing waves. The cordless clock keeps running during a utility power failure, although an extended power failure may temporarily affect its timekeeping quality. The batteries last from one to two years.



Can You Cry For Science?

There's a crying need for tears at the Medical Center of the University of California at Los Angeles. Dr. Robert Brunish is studying the chemical composition of tears in an effort to find the elusive eye irritant in smog. Tears, according to Doctor Brunish, are not just drops of salt water, but a complex solution with a high protein content. Tears shed in pain, sorrow or anger differ from those touched off by peeling an onion or by smog. Doctor Brunish has been able to obtain plenty of small-fry tears from the children's ward of a hospital, but grown-up tears are more difficult to find.

☛ The world air-transport fleet — aircraft operating in scheduled service — totals approximately 2800 planes.

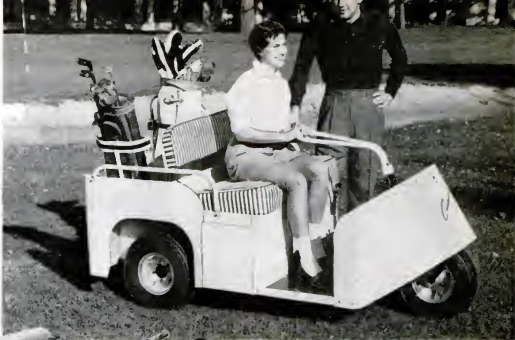
Cushman will travel up to 36 holes without recharging, carries two passengers and has carrier space for as many as four golf bags. It climbs steep hills, has forward speeds of three and seven miles per hour, one rear speed. Four automotive batteries power unit

Cushman Motor Works,
Lima, Ohio.

Golfers Mobilize



WALKING from one green to another used to be as much a part of the game of golf as the clubs themselves. But now, more and more people are cruising around the fairways in electric or gasoline-driven cars. Apart from the golfers who just dislike exercise, the mobilized ranks include many who, because of age or doctor's orders, would have to give up their favorite sport because of the strenuous hikes and climbs that the golfers' cars eliminate. Battery-driven cars are the most popular on the nation's courses. Shown on this page are some of them.

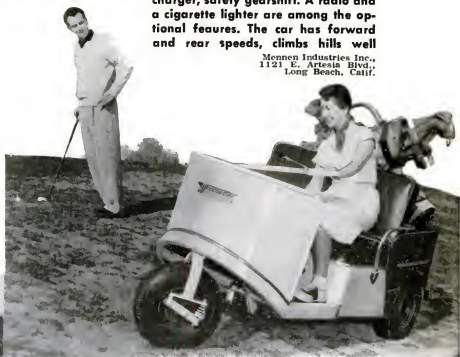


Victor also has two-wheel differential drive and forward or reverse operation. Batteries power the 1½ horsepower, 24-volt d.c. lifetime-lubricated motor. It has disk brakes, direct drive, adjustable steel brake rod directly connected to the pedal

Victor Adding Machine Co.,
3900 N. Rockwell St., Chicago 18

Westcoaster has all-point coil-spring suspension, heavy-duty batteries, V-belt drive, moistureproof built-in charger, safety gearshift. A radio and a cigarette lighter are among the optional features. The car has forward and rear speeds, climbs hills well

Mennen Industries Inc.,
1121 E. Artesia Blvd.,
Long Beach, Calif.



Low slung Lectracar has dentproof and corrosionproof plastic body and weighs only 600 pounds. A foot pedal controls both forward and reverse speeds and braking. It has a maximum speed of 10 miles per hour and can run 20 miles without a recharge

Sears Roebuck and Co.

OWNERS REPORT:

Who knows most about a car? Its owner? The engineer? Or a veteran road tester? *Popular Mechanics* lets you hear from all three in this report on the '56 Cadillac

Why Did They Buy a Cadillac?

24.0% said

Previous Experience

"Previous satisfactory experience."

RHODE ISLAND PHYSICIAN

13.0% said

Prestige, Pride, the Name

"Prestige of the car."

OHIO DISTRICT MANAGER

"Some snob appeal."

KANSAS FARM OWNER

12.3% said

Low Depreciation

"Can sell my car each year and get a new one with very little loss."

WASHINGTON THEATER OWNER

What Do They Like Best About Cadillac?

35.0% said

Riding Quality

"I like its riding quality and comfort. I put 50,000 miles a year on my car."

TENNESSEE TRAVELING SALESMAN

32.7% said

Power, Performance

"Plenty of power to pass trucks and cars. Speed with ease."

OKLAHOMA OIL MAN

What Are Their Complaints?

23.7% said

Poor Assembly

"For its price, it should be better assembled. Too many little things not properly taken care of. Continuous return to dealer takes up too much of one's time."

ILLINOIS EXECUTIVE

22.7% said

Transmission Trouble

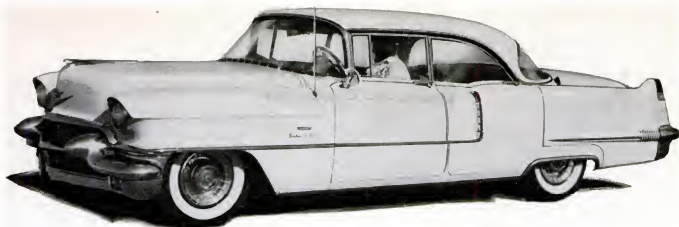
"New transmission is slow to take hold when cold."

IOWA INVESTOR

"Dislike new transmission very much. This is second transmission within 6000 miles."

TEXAS SALESMAN





Owners Praise Cadillac's Performance But Complain of Transmission Troubles

As Told by Owners of 1956 Cadillacs

CADILLAC CONTINUES to impress people. Our Owners Report proves it and so did our survey on why people buy the cars they do (February 1956). Regardless of income group, more people would like to own Cadillac than any other car—and by a wide margin.

What is there about Cadillac that makes it a symbol? What do owners like most about the Cadillac? Why did they buy a Cadillac? We asked 1000 owners of 1956 Cadillacs. This article is their report.

The most frequently mentioned reason for buying a Cadillac is "previous experience." Cadillac owners usually buy Cadillacs again. As a Virginia optometrist writes:

"I bought this Cadillac because I didn't want to step down in class."

Second reason is prestige or pride of ownership. Third is the car's resale value.

When asked what they like most about their cars, 35 percent of the Cadillac owners say its riding qualities.

"Rides smoothly. Drove 460 miles yesterday and felt not a bit tired."—New Jersey realtor.

"I like best its riding qualities and comfort on long trips. I put 35,000 to 50,000 miles a year on it."—Tennessee salesman.

"I like the ease of getting in and out of it plus the comfort it gives on long trips as

(Continued to page 107)



CLYMER ROAD TESTS THE 1956 CADILLAC

By Floyd Clymer

THE TEST CAR was the 1956 Series 62 Special four-door sedan. The route was to Las Vegas, Nev., returning via Death Valley, Lone Pine, across the Mojave Desert and over the Angeles Crest mountain highway to Los Angeles for a distance of 729 miles, which included some testing over desert and mountain back roads.

The new 365-cubic-inch engine (upped from 325 last year) now has 9.75:1 compression ratio (9.0:1 last year). Horsepower is up from the 250 in last year's

car to 285 at 4600 revolutions per minute.

The Cadillac engine is perfection personified—it is smooth, flexible, powerful, responsive and has less engine vibration than any car I have ever tested. American cars, by public demand, have soft springing. As a result, there is considerable "roll" when cornering at speed and Cadillac is no exception. But stability is good and this is due somewhat to the fact that rear-wheel tread is wider by 3.16 inches than the front

(Continued to page 258)

An Engineer Analyzes the 1956 Cadillac

By Dale Kelly, SAE

ACCELERATION



Model tested: Series 62 four-door sedan with automatic transmission, power brakes, power steering, power seats and windows, air conditioning. Rear-axle ratio: 3.36 to 1 (measured). Curb weight: 4920 pounds with gas tank half full (53 percent on front wheels, 47 percent on rear wheels). Measured wheelbase: 129.5 inches left, 128.5 inches right.

TIME IN SECONDS	0 to 20	0 to 40	0 to 60	0 to 80	1/4 mile
Ignition timed for regular gasoline	3.0	6.8	12.7	21.1	19.4
Ignition timed for premium gasoline	3.1	6.5	12.0	19.8	19.15

(Watches started instant accelerator floored. Engine was not run up against brakes before start. Drive 4 range was used. No improvement could be obtained with transmission in Low.)

FUEL ECONOMY



MILES PER GALLON	Steady 30 m.p.h.	Steady 50 m.p.h.	Steady 70 m.p.h.	Traffic Route
Ignition timed for regular gasoline	20.2	17.1	13.9	7.9
Ignition timed for premium gasoline	20.8	16.9	13.4	8.3

(On traffic route, car makes 10 full stops per mile and is driven at an over-all average of 15 miles per hour.)

ESTIMATED ANNUAL GASOLINE BILL: \$196 FOR 10,000 MILES

Figured at 2000 miles at 20 m.p.h., 5000 miles at 50 m.p.h., 1500 miles at 70 m.p.h. and 1500 miles in traffic and on the assumption that 25 percent will be able to get satisfactory performance on regular (27 cents a gallon), the rest requiring premium (29 cents a gallon).

SPEEDOMETER ERROR



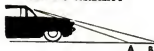
MILES PER HOUR	Indicated speed	20.0	30.0	40.0	50.0	60.0	70.0	80.0
True speed		20.0	30.0	41.0	50.0	60.0	70.0	80.0

(This is an unusually and commendably honest speedometer.)

ODOMETER ERROR: The odometer indicated 1 1/2 percent less than the actual distance traveled (98.5 miles for an actual 100).

(This is unusual. The error is on the low side.)

DRIVER'S VISIBILITY



Some portion of the road could be seen 13 feet in front of the car (A in sketch) by an average driver (5 feet 9 inches tall); full width of the road could be seen 23 feet in front of the car (B in sketch).

GROUND CLEARANCE



The bottom corner of the rear overhang would touch the ground if the car were driven up an incline whose profile had a radius of curvature of less than 25 feet (see sketch). Bottom of the differential was 8 1/4 inches from the ground and should not give trouble except in deep ruts which are almost extinct.

MISCELLANEOUS

Octane requirement: Acceleration and fuel-economy tests with regular gasoline were taken with ignition timing set at top dead center (slightly retarded from manufacturer's recommendations). The fuel used was an 85-percent octane blend of octane and heptane, the equivalent of a typical regular fuel of 88 octane Research. For premium-gasoline tests ignition timing recommended by manufacturer (5 degrees before top center) was used. At this setting, engine did not knock on a 90-percent blend of octane and heptane, the equivalent of a typical premium fuel of 95 octane Research. Timing could, in fact, have been still farther advanced without knock, if desired.

Steering: From straight ahead, the steering wheel had to be turned 0.8 of a revolution to complete a circle with an outside radius of 50 feet. Lock to lock, the wheel required 4.25 turns. Turn-circle diameter, curb-to-curb, was 43.4 feet; from wall-to-wall 46.2 feet. Steering-wheel diameter: 18 inches.

Trunk capacity: In addition to spare tire and tools, the trunk accommodated 11 cardboard cartons of the size used for 48 tall cans of evaporated milk. The car tested was a four-door sedan, a coupe would have a roomier trunk.

Interior sound level: Inside the car the noise level with all windows closed was 91 decibels at 40 m.p.h., 95 decibels at 60 m.p.h., on a smooth road.

Water resistance: Car was washed in an automatic high-pressure car wash and driven through a standard splash pan. No water entered the trunk or passenger space. Ignition and brakes were not affected.

Cadillac trunk holds 11 canned-milk cartons, used by Kelly as a yardstick to measure trunk capacity. The air conditioner occupies some of the trunk space

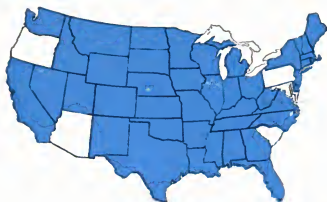
Center of gravity: Center of gravity of unloaded car was 21.5 inches above the ground.

Gasoline fill rate: Fuel tank could be filled at the rate of more than 13 gallons per minute. This is faster than the standard pump can deliver it.

Brakes: Both hand brake and foot brakes worked well. Hand brake held the car on a 14-percent grade. Reserve vacuum tank had enough capacity for three or four brake applications with the engine not running.

Air conditioner: Use of air conditioner reduces gasoline mileage by approximately 0.5 of a mile per gallon in highway driving. The air conditioner is relatively ineffective at 30 miles per hour or less unless engine speed is increased by the use of Drive 3 range. In this range, mileage is 13.4 miles per gallon at 30 miles per hour with air conditioner operating.





Cadillac owners in 43 states (in color) took part in the poll. Their opinions are summarized below

THE OWNERS ANALYZE THE 1956 CADILLAC

OVER-ALL RATING

Excellent	69.0%
Average	25.9%
Poor	5.1%

Over-all performance is

Outstanding	66.4%
Average	29.3%
Below average	4.3%

Over-all handling is

Outstanding	76.8%
Average	21.5%
Below average	1.7%

Exterior styling is

Outstanding	66.9%
Average	31.4%
Below average	1.7%

Styling influenced choice of car?

Styling was important.....	33.8%
Styling not important.....	57.1%
Did not answer.....	9.1%

Had trouble with engine?

No trouble.....	79.3%
Some trouble.....	17.0%
Considerable trouble.....	3.7%

What was engine trouble?

Carburetor	5.4%
Valves	4.7%
Pings	3.7%
Oil leaks.....	1.7%

Had trouble with Hydra-Matic?

Yes, had trouble.....	24.7%
No, had no trouble.....	75.3%

Owned Cadillac before?

Yes, have owned before.....	84.5%
No, have not.....	15.5%

Is new Hydra-Matic better?

Yes, it's better.....	71.0%
No, it's not as good.....	17.7%
It's about the same.....	11.3%

What make of car was traded?

Cadillac	72.1%
Other General Motors car.....	11.0%
Ford Motor Company make.....	2.2%
Chrysler Corporation make.....	1.3%
Other make.....	1.0%
No trade or no answer.....	12.4%

Trade-in allowance on Cadillacs

Excellent	36.3%
Average	45.8%
Poor	14.6%
No answer.....	3.3%

Trade-in allowance other makes

Excellent	19.1%
Average	51.1%
Poor	25.5%
No answer.....	4.3%

What year Cadillac was traded?

1956 Cadillac.....	0.4%
1955 Cadillac.....	29.3%
1954 Cadillac.....	29.7%
1953 Cadillac.....	19.4%
1952 Cadillac.....	10.4%
1951 Cadillac.....	5.8%
Earlier models.....	5.0%

Would buy a Cadillac next time?

Yes	65.2%
Might	28.3%
Would not.....	6.5%

Dealer service is

Excellent	50.2%
Average	38.9%
Poor	10.9%

Who are Cadillac owners?

Businessmen	48.3%
Retired owners.....	10.7%
Doctors, dentists.....	9.0%
Formers, ranchers.....	6.7%
Salesmen	6.7%
Lawyers	2.0%
Others	16.6%

Best-Liked Features

Riding qualities.....	35.0%
Power, performance.....	32.7%
Handling ease.....	28.3%
Styling	21.0%
Transmission	8.3%
Low depreciation.....	7.0%
Power brakes.....	7.0%
Prestige	6.7%

Most-Frequent Complaints

No complaints at all.....	33.4%
Poor assembly.....	23.7%
New transmission.....	22.7%
Body rattles.....	12.0%
Uses too much gas.....	10.7%
Engine troubles.....	10.3%
Poor dealer service.....	7.0%
Door fits.....	6.0%

Why Did They Buy Cadillac?

Previous ownership.....	24.0%
Prestige, the name.....	13.0%
Resale value.....	12.3%
Styling	10.0%
Quality	7.3%
Riding comfort.....	6.0%

well as in town."—North Carolina widow.

Almost as popular with owners as the excellent ride is the power and performance of Cadillac's 285-horsepower engine. This feature is mentioned by 32.7 percent.

"Plenty of power to pass big trucks and cars. Plenty of speed with ease."—Oklahoma oilman.

"Smooth power. Living in hilly country this means a lot when you come to a steep grade."—Washington theater owner.

"Adequate horsepower in emergencies."—New York engineer.

"I never drove a car with better performance."—Iowa farmer.

Third most frequently mentioned of the best-liked features is handling ease with 28.3 percent mentioning it.

"It drives so easily."—Nebraska rancher's wife.

"Very easy to park in a small space."—California owner.

But Even Cadillac Is Not Perfect

Although 33.4 percent of the Cadillac owners don't make a single complaint, the car does have faults, say 66.6 percent.

And the most frequently mentioned of the faults is the same as the one most frequently mentioned by owners of many low-price cars: poor assembly. Nearly one quarter of all the Cadillac owners complain of slipshod workmanship (23.7 percent to be exact), and many of them complain vehemently.

"I think it is sad that the standards are such that a fine car at such a high price has the same evidence of sloppy, fast-production defects found in all cars at any price."—California Eldorado owner.



Owners report they like the rear-view-mirror control. Handle inside door (arrow) lets driver move mirror with window closed



Above, new this year is the center-mounted brake pedal. It straddles the steering column and is easily operated by either foot. Below, some owners complain about the extra-big horn ring. It is too close to the steering-wheel rim for comfort



"Mechanically the poorest of the four Cadillacs I have owned. For this amount of money one should not expect a slam-bang careless assembly nor accept any adjustment they cram down your throat."—Oklahoma oilman.

"Factory inspection poor. Radio not wired up. Map light same. Faulty backup lights. One door lock inoperative. Gas tank delivered with huge dent in bottom. Trip mileage not working. Headlights out of focus. Door-top snap closures stay open. No effort by factory to rush replacements for defective parts."—Montana police officer.

"It was minus half of the screws in the interior. Upholstering wasn't put on right. Gas gauge broken. Aerial doesn't work. Brakes squeak. Air comes in around windows. Rattles and squeaks in all doors."—Texas housewife.

Cadillac has the new Hydra-Matic transmission in its 1956 models. This new version of the four-speed automatic transmission has a second fluid coupling to eliminate the jerkiness characteristic of the previous unit. Many of the owners are not impressed with the new transmission and 22.7 percent list it as one of their complaints, making it the second highest on the gripe list.

"Transmission is not as good as old one. In cold weather it does not take hold at once."—Michigan machinist.

"Hydra-Matic went bad at 1500 miles. Clutches burned out."—Illinois executive.

"Transmission has no pickup. Uses too much gas. Had to put a new one in at 6000 miles."—Texas salesman.

"Downshift does not always work on flooring accelerator."—New York lawyer.

"Hydra-Matic went out at 325 miles. Car was laid up 16 days."—Idaho motel owner.

Third on the list of complaints is another familiar one: body rattles. Apparently luxury cars are no different from other cars in this respect.

"Windows and doors rattle."—Idaho government worker.

"Body rattles more than any other Cadillac I have ever owned."—California broker.

(Continued to page 250)



Newest transport by Douglas for the Air Force, the C-133A, carries a radar scanner in its big, black nose

Latest Flying Freighter Can Carry 200 Troops

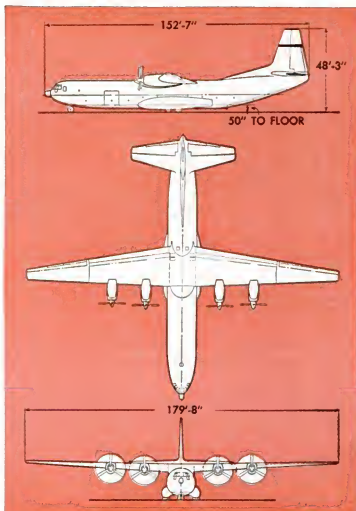
IF YOU PARKED America's newest military transport on a football field with its nose at the goal line, its tail would be two feet beyond the 50-yard line. Its wings would spread 10 feet past each sideline.

Including its radome nose, the aerial monster is 152 feet 7 inches long. Wingspan is 179 feet 8 inches. Even though the fuselage squats close to the ground for easy handling of cargo the top of the tail is more than 48 feet tall, about the height of a four-story building. The fuselage is 16 feet in diameter.

The Douglas-built C-133A can carry twice the payload of the Douglas C-124 Globemaster, and nearly any military vehicle can be driven up a low ramp under the tail and into the cargo hold. A load might include two big prime movers weighing 20 tons each, 16 loaded Jeeps and 20 jet engines. The plane can be modified to carry more than 200 troops, or can serve as a hospital plane. Its cargo hold is heated and pressurized for high flights.

Now undergoing flight tests, the C-133A is powered with four Pratt & Whitney T34-P-3 turboprop engines each rated at 6000 horsepower. Each engine drives a three-bladed turboelectric propeller 18 feet in diameter. A battery starts auxiliary gas-turbine engines which supply compressed air for starting the main power plants. A crew of four flies the plane.

Plane is designed as a cargo or troop transport. The fuselage is 16 feet in diameter, with clean interior



TARGET: Satellite Europe

By Clifford B. Hicks

A FEW MONTHS ago officials of Free Europe Press learned of a sports event to be held in Prague. About 100,000 people were expected to jam the stadium.

This seemed an ideal target. Free Europe Press and Radio Free Europe are twin projects of a group of American citizens banded together into the Crusade for Freedom. The purpose of the Crusade is to penetrate the iron curtain by radio broadcasts and, more recently, by balloons which shower down leaflets by the millions.

To officials of the organization, the Prague sports event was too alluring a target to pass up. For three weeks in advance they sent up practice balloons which were carried by westerly winds into Czechoslovakia.

At last came the morning of the event. The leaflets were fastened to the balloons, which were released at the proper moment and disappeared high in the sky.

Some 4½ hours and 150 miles later, the leaflets suddenly spilled down on 100,000 spectators jammed into the arena. Thanks to amazingly accurate forecasts and a bit of windblown luck, Free Europe Press hit its target smack on the button.

The Prague incident is an example of the bull's-eye accuracy with which the organization is lobbying the truth across the iron curtain. During the past two years Crusade for Freedom has launched more than 400,000 balloons carrying more than 250,000,000 leaflets into the satellite countries.

For the most part the leaflets are illustrated biweekly newspapers which carry items of interest to citizens of the target country. A typical issue may contain stories about prominent citizens who are living in the West, book reviews,



Girls pack miniature newspapers into open cartons which will be dumped by balloons. Two different systems are used. Following pages show another type of balloon which holds leaflets in bundle without carton. Below, dry ice is weighed to the gram



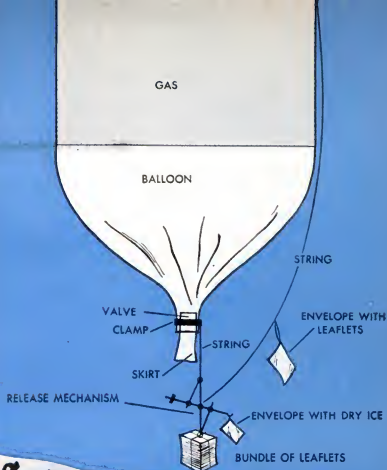
sewing patterns and craft projects.

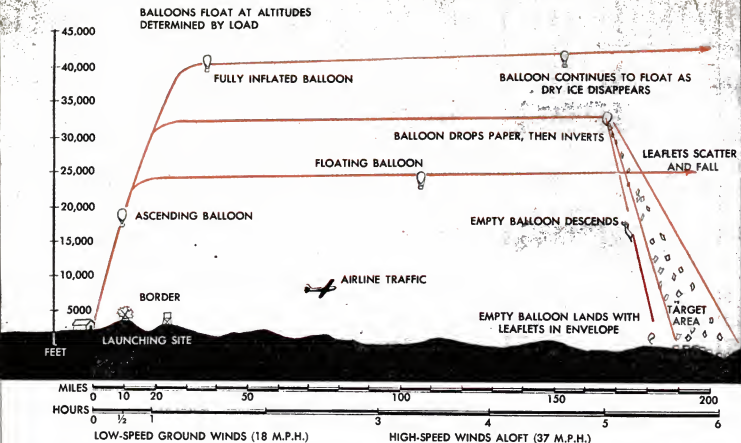
These newspapers reach their targets on inexpensive polyethylene balloons measuring 13 feet high and carrying a payload of less than 10 pounds. Filled with hydrogen, the balloons rise to predetermined levels from 24,000 to 40,000 feet—high above airline traffic—where the winds carry them along at speeds up to 37 miles per hour. They may travel 200 miles before the release mechanism dumps the leaflets.

Considering its accuracy, the mechanism is surprisingly simple. It is a cross made of linked sections of wire. On one arm is a small counterweight. On the opposite arm is hung a package of dry ice, weighed to the gram. The leaflets are hung by a cord or suspended in an open-top box from the bottom of the cross.

As the balloon moves along its invisible airway, the dry ice vaporizes. Over a distance of 150 to 200 miles the counterweight gradually presses down the arm. Then

Leaflets carry news items of particular interest to target country. Drawing shows complete assembly of balloon and release





Balloons go much higher than airline traffic. Blown at speeds up to 37 miles per hour, they may travel 200 miles

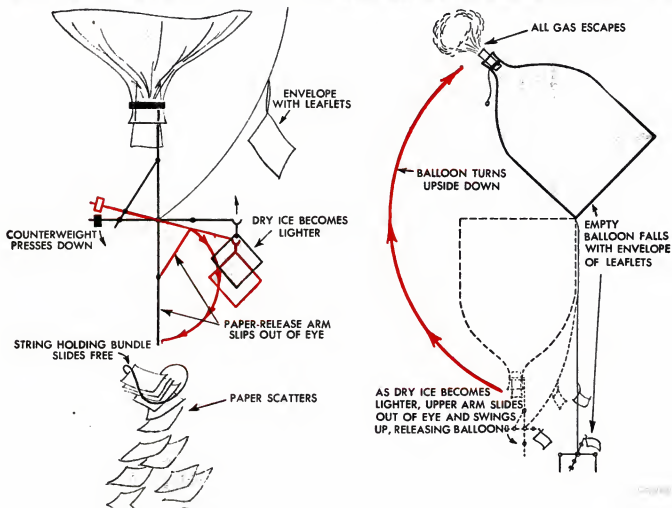
at a predetermined moment the crossarm droops low enough to release a wire which is threaded through an eye. A string then slides free, releasing the leaflets.

Meanwhile, something else happens to the balloon. Another wire slips out of an eye, releasing the bottom of the balloon. Held now only by a string to the top, the balloon swings upside down and all the gas

escapes through the open neck. The balloon then falls to the ground, harmless but carrying an envelope holding more leaflets.

So effective is the leaflet barrage that the Communists attempt to shoot down the balloons with planes and antiaircraft guns. But anything that goes up must come down, and the leaflets still reach the hands of the people below. ★ ★ ★

As dry ice evaporates it becomes lighter, and counterweight triggers release. Gas escapes when balloon inverts





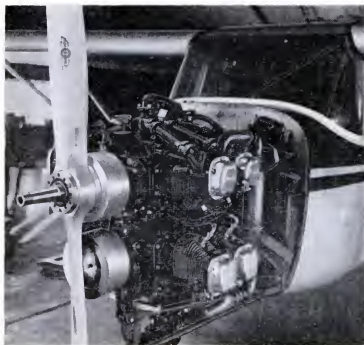
Back propeller linked through pulley to lower engine is spinning. Front propeller operates from top engine

Twin-Engine Safety for Light Plane

LOOKING FOR AN EXTRA MARGIN of safety in light airplanes, Joseph L. Halsmer, Lafayette, Ind., has equipped a four-place Piper Tri-Pacer with two engines instead of one. Mounted over-and-under and driving two propellers in line with each other, the engines each develop 95 horsepower and replace the plane's original 150-horsepower plant. Separate instruments and throttles are provided for each

engine, and one can idle while the other is revving up. Thus, if one fails, the other serves as a spare. With power on both engines, cruising speed is 130 miles per hour, compared to 120 on the original engine, while gas consumption only rises from 10 gallons per hour to 11. Halsmer estimates that the two-engine installation increases the plane's cost by \$800 or \$900, and has applied for a patent on the arrangement.

Top engine is installed upside down. Eight V-belts in separate grooves link back prop to lower engine



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Now You're Cooking With _



Toast a la Sol coming up! Toaster is simple form of solar cooker. Aluminum reflector concentrates heat
Amateur radio station is powered by this solar engine which turns a turbine to develop electricity

OLD SOL has put on a chef's cap and picked up a spatula. And not only is he going to take up cooking, but he's also going to work in other ways. He'll be busy changing ocean water into fresh water, heating homes during winter months and cooling them in the summertime, and even supplying electric power in areas where fuel and water power are scarce.

All of these facts came out at the World Symposium on Applied Solar Energy held a short time ago at Phoenix, Ariz., where inventions from all over the world for converting the sun's heat into useful work were put on exhibition.

Most fossil fuels, especially oil and gas, are diminishing in supply rapidly. Water power is limited in expansion by the number of suitable rivers—and the fact that not all areas have water resources. The two sources of energy, then, that will provide the world with its power in the future are nuclear fission and the sun.

One conclusion reached at the symposi-



the Sun

um was that solar heat seems well adapted for doing such jobs as cooking meals, heating water, heating or cooling a home and for pumping water, but it is improbable that the sun's energy will be harnessed for producing large amounts of central-station power in the foreseeable future.

Solar energy is so diffuse that very large tracts of land would be required for the equipment to do such a job. Nuclear energy has much more promise than solar energy for delivering large amounts of power.

But solar energy will be important and, in fact, is already used in areas of the world where fuels are scarce — India, Arabia and Lebanon. In these areas, solar cookers are already being manufactured commercially.

The solar energy hitting the United States every year, scientists say, is equal to 2000 times the present total heat and power requirements of the country. The chief problems in putting this energy to work have been how to collect the heat, concentrate it and contain it. Thus far, these problems are only partially solved, and most inventions using solar energy can claim only about a five-percent efficiency. Experimenters say that improved designs could raise this to about 10 percent.

Efficient or not, the sun machines on display at Phoenix seemed to be doing the jobs for which they were designed.

The solar stoves really



Above, aluminum solar oven on display at Disneyland. Sun's rays are reflected into oven where they build up enough heat to cook roast

Below, for use on picnics, a portable solar cooker that folds up like an umbrella. Aluminized fabric reflects sun's rays to cooking grill





Developed in Japan, solar rice cooker has a latitude scale to aid in tilting toward sun

This collapsible cooker folds into space less than a small suitcase, cooks food rapidly



Solar stove with one glass well which can be pointed toward sun. Aluminum side panels concentrate heat

cook the food placed in them. Most of these consist essentially of reflective devices which pick up the sun's rays and direct them toward an oven or grille. Some have concave circular reflectors that focus all the rays on one spot; others are of the "hot box" type—an insulated oven with reflector wings that direct the heat of the sun inside.

Members of an Arizona fine-arts club displayed a solar kiln for glazing pottery. Using a relatively flat plastic lens mounted on an equatorial framework, they focus the sun's rays on the object that has been coated with glazing material. Temperatures in excess of 1000 degrees are created and the heat rapidly melts the glaze allowing it to flow over the object.

Another attention getter was a solar "engine" invented by Jack Hedger, of Lakeside, Calif., to operate his 100-watt amateur radio station. The engine consists of a curved aluminum reflector that focuses the sun's heat on a black central copper tube in which a lightweight (SAE 10) engine oil is circulated. Heated to 400 degrees, the oil is used to boil water and produce steam. The steam in turn drives a home-made turbine connected to an electrical generator.

When Hedger is not using the sun for direct radio transmission in the daytime, he switches the power to a battery charger and charges a bank of storage batteries. Thus he can operate his radio station on solar power even after dark.

Short, rapid strokes of mechanical power



Solar engine called the Novoid produces pulsations through cycle of boiling water and condensing steam



Pottery glazing with solar heat of over 1000 degrees is new twist to ancient art. Flat lens focuses rays

are produced by a new solar engine called the Novoid. The apparatus uses a curved reflector to focus the sun's heat on one end of a pipe filled with water, and the heated water alternately explodes into high-pressure steam and then condenses again. Strong pulses of hydraulic thrust are thus produced at the other end of the pipe.

Dr. Maria Telkes of New York University, a leader in solar-power research, exhibited a solar still for converting sea water to fresh water. This and other stills shown would be able to accomplish this at an average cost of 86 cents per 1000 gallons—a cost that is not too high, considering that the need for fresh water is one of modern civilization's most pressing demands.

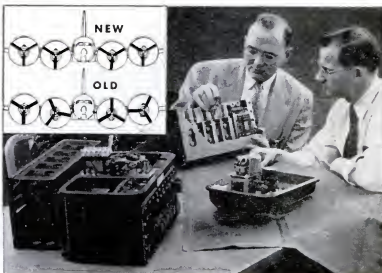
The stills all work on the same basic principle. Ocean water is run very slowly through a shallow trough covered by a transparent roof. The sun shining through the roof heats the water, causing some of it to evaporate and collect on the roof. This condensate is pure water which trickles into gathering troughs near the edge of the roof and then runs into storage containers below.

The symposium indicated that research into how to use the sun's energy has just reached the threshold of practical application. Advances should be rapid from this point forward. It won't be long until you'll be cooking with the sun—on the outside burner. ★★★

Synchrophasing of Propellers Quiets Plane-Cabin Noise

Sound engineers have discovered that sound waves emanating from the propellers of multiengine aircraft beat together to create additional sound and vibration in the plane's cabin. To combat this, an electronic synchrophaser, that varies the pitch of each propeller slightly to keep its sound waves in phase, has been developed. Weighing only 35 pounds, the equipment is as effective in decreasing the noise in the cabin as 800 additional pounds of insulation.

Diagram shows how synchrophaser adjusts propellers to quiet them





Reclining Seat Fits Any Car

Now you can install a reclining front seat in any car (left). A finger-touch adjustment control tilts the seat forward or backward and locks safely in place. A companion piece to the reclining seat is a soft headrest that protects against "whip lash," caused when the head bounces back and forth after bumper-to-bumper accidents. The unit is made here from patents developed in Germany.

Tire "Pumped Down" With Fast Deflator

Tire changing is speeded by a deflating tool (below) that uses the air hose to "pump down" the tire. So fast is air exhausted from the casings that the beads on tubeless tires break away from the rims. The device works by a siphoning action. Air from the hose rushes past the valve stem and drags the air from the tire. It is especially useful in deflating large tires.



Hormone Makes Pale Apples Blush

Science is teaching pale apples to blush a brilliant red. A new chemical is sprayed on trees 14 days before the fruit is picked. It causes the apples on the lower boughs, usually much paler than those on top, to turn red. The chemical also keeps the top apples from falling too soon. Made from a plant hormone which nature uses to ripen apples, the spray was developed by Treesdale Farm, Mars, Pa., working with Pennsylvania State University.

Oil Cup for Batteries Stops Corrosion

Car and truck batteries remain corrosion-free when the terminals are fitted with plastic oil cups. The heavy-grade oil in each cup surrounds the terminal to prevent the build-up of oxidized material that interferes with electrical contact. A screw-on knob fastens the battery cable to a thimble that grips a clamp mounted on the battery post. Because there is no corrosion formation, there is no variation in line resistance. The correct setting of the voltage regulator is maintained, giving protection from overload to the entire electrical system of the vehicle.





Kit includes all materials needed to do the job



Adhesive to join cover sections is squeezed from tube



More adhesive is used to cement sections together



The book cover is painted with waterproof coating

Kit Permits Amateur to Bind Books and Magazines at Home

You can rebind old books, or bind notes, pocket-size books and magazines into hard-covered books with a new kit. A strong adhesive is used to cement the ends of the pages together without sewing. The kit includes tubes of a waterproof coating for

the covers, adhesive, a bottle of solvent, water colors, ruler, compass, brushes, hinge stick, rounding block, book papers and other necessary items. Heavy cardboard is used in making the covers. Binding a book with the kit takes about an hour.

Chemical Deodorizes Air In Swiss Transport Planes

Cigar-smoking will be permitted on Swissair airliners, now that a new device which eliminates cooking and smoking odors from the air has been installed in the cabins. Called P-6, the chemical which does the work is a hydrocarbon compound. Small containers, filled with glass fiber that has been treated with P-6, are placed throughout the cabin. Tests indicate that P-6 will keep the air clean and fresh for long periods and, as an additional advantage, is helpful in preventing airsickness.

Tiny containers of P-6 located throughout cabin eliminate cooking and smoking odors

ⒸRussia has 700,000 TV sets, America 31,000,000 and Britain nearly 4,000,000, according to the United Nations.





Auto-Top Sleeping Bunk Folds Into Compact Package

Motorists can now carry a ready-to-use sleeping bunk on top of their cars. At night the unit is expanded from a compact 150-pound package and a screened tent encloses the sleepers. A two-piece telescoping tubular-steel ladder is part of the equip-

ment. The innerspring mattress measures four by six feet and holds two comfortably. A rear boot designed for some types of station wagons screens the interior of the car so it can be used for sleeping as many as four adults and three children.



"Mechanical Stomach" For Elevators

Elevator engineers have devised a "mechanical stomach" that measures the sudden changes of speed which make human stomachs queasy. The little instrument rides up and down in the elevator to record its findings on a moving graph. With the graph, engineers can adjust the elevator for a smooth, comfortable ride. The instrument, built by Westinghouse, contains a spring-suspended weight which "weighs" more or less as the elevator moves up or down. An arm attached to the weight tips to close one of two electrical circuits. One of the circuits energizes a magnet to bring the weight back down, the other acts to bring it back up. The current flow powers the drawing of the graph to record acceleration and deceleration.

☞ Claiming a sharper, truer picture, the owner of a drive-in theater near Melbourne, Australia, has installed a projection screen, measuring 45 by 98 feet, of a specially treated aluminum.



Motor Scooters Replace Horses in Berlin Trotting Races

In Berlin, Germany, the horse lost another battle in his fight against extinction as motor scooters took over the pulling job in trotting races. The scooters, boasting five horsepower each, towed their sul-

kies around the track at a Berlin sports show. Members of a German cycle club manned the scooters, while lady jockeys held the reins in the sulkies. Fans found the race noisy and exciting.

Antiwind Wall Protects Ships

Ships moored at a dock in Marseilles, France, are protected from high winds by a slatted shield (arrow) on a low building beside the dock. The shield cuts a 77-mile-per-hour gale down to a speed of 17 miles per hour, facilitating unmooring and the final phase of mooring. It permits cranes to operate more easily and passengers to embark and disembark without inconvenience. The top of the antiwind wall is 74 feet above water level, so that most of the exposed areas of a large ship are protected. The wall is 394 feet long, and will be extended another 82 feet when an extension of the building on which it is mounted is completed.



WHAT'S NEW FOR



1. AIR CLEANER consists of a fan mounting an electronic filter that traps dust, pollen, even smoke. Filter pads remove coarse particles. Fine particles are charged, attracted to an electrostatic collection plate and held there by adhesive coating

Radex Corp., 2076 Elston Ave., Chicago 14

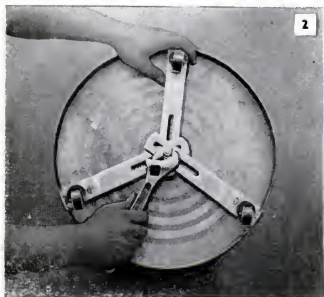


2. DOLLY can be fastened to the bottom of any garbage can so that it can be pushed rather than carried. The ball-bearing casters roll easily on any hardtop driveway or sidewalk. The elevated position of the can prevents rusting away of bottom

Sphere Engineering & Mfg. Co., 648 S. Illinois Ave., Villa Park, Ill.

3. WINDOW LOCK permits you to go away and leave windows open, yet securely latched. Bolt of clamp on lower sash is screwed into one of three holes in plate on upper sash. Either sash can be opened. Burglars can't get in and children can't crawl out

Pilgrim Products Co., 10 Clarence St., Worcester 5, Mass.





4. SLIDING PANELS on each side of an aluminum-frame picture window provide ventilation. Panels are behind louvers on the side or bottom of the window. Window screen or filters go into space between

Maco Corp., Huntington, Ind.



5. WHEELED REEL for garden hose rolls easily about the yard on rubber tires. It holds 200 feet of plastic or 100 feet of rubber hose. One model can be connected to faucet and unreels as water runs

Specialty Mfg. Co., 2356 University Ave., St. Paul, Minn.

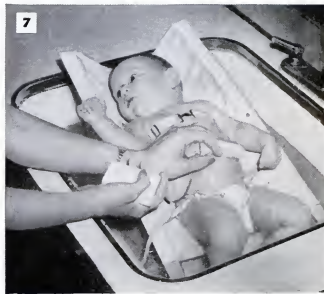
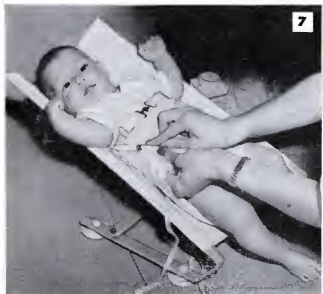
6. NUTCRACKER that fastens to any table, shelf or counter cracks shells without breaking the kernels. Unyielding pressure is applied with a long hand lever against nut held lengthwise in jaws of aluminum unit

Woldert Co., Inc., Tyler, Tex.



7. BATH HAMMOCK holds baby while he is washed in kitchen sink, leaving mother's arms free. Suction cups anchor metal frame. Holding straps are adjustable. Unit also serves for changing, feeding, dressing

New York Art Iron Works, 47-18 37th St., Long Island City, N.Y.





Giant Jungle Destroyer Clears Forested Land

Packing three times the wallop of an M-24 tank, a mechanized monster called "The Tree Crasher" has begun land-clearing work in the Florida-Georgia coastal area. It was designed to uproot heavy trees and is controlled by an operator sitting in a tiny cab high over the front wheels. With the blade raised about 10 feet in the air, he maneuvers into larger trees, pushing them over, roots and all. For smaller trees and

underbrush, he moves in with the blade lowered. Weighing 120,000 pounds, the machine rolls on six huge tires, each 10 feet tall and four feet wide. Instead of receiving power from one central drive, each of the mammoth wheels has its own electric motor and gear reduction. These motors are driven by generators which, in turn, are driven by two giant diesel engines near the center of the unit.



Top, belt before crash. Middle, during crash. Bottom, after crash. Pressure is released, belt falls apart

Seat-Belt Safety Release

Lifesaving seat belts in autos and planes are released automatically after a crash by a new device. Dazed victims can't be trapped in the wreckage by a seat belt that refuses to open. The safety release is built into the under-the-seat section of a standard seat belt and remains undisturbed under ordinary usage. But when extreme pressure is applied, one section slides to a hook of the other, still holding the belt until all pressure is removed. Then it simply falls apart, the two halves of the belt divide, and the passenger is free.

Pasteurized Eggs

Pasteurizing eggs by dipping them into warm water for two to three minutes before storing cuts spoilage losses almost to the zero point, according to a team of Australian scientists. In experiments, they found 60 percent losses after just a simple washing, and as low as one percent losses after pasteurization. The brief hot bath, in water at 145 degrees Fahrenheit, does not affect the physical condition of the eggs, while it does destroy most of the harmful bacteria that cause rotting.



TV Guards Gate

Secretary talks by direct phone to visitor at gate while she observes him on TV screen. She presses buttons to open gate

TV TAKES the place of a gateman at the Nine Mile Point generating station of Louisiana Power and Light Company, across the Mississippi River from New Orleans.

A TV camera pointed at the gate permits an office employee to do the gateman's work. Using a direct telephone, she can talk to as well as see visitors. Four push buttons give her control over the opening of the gate. Most of those who try to enter are employees or visitors known to plant officials. When strangers arrive unheralded, an official walks the few feet to the gate to conduct a personal interview before admitting them.

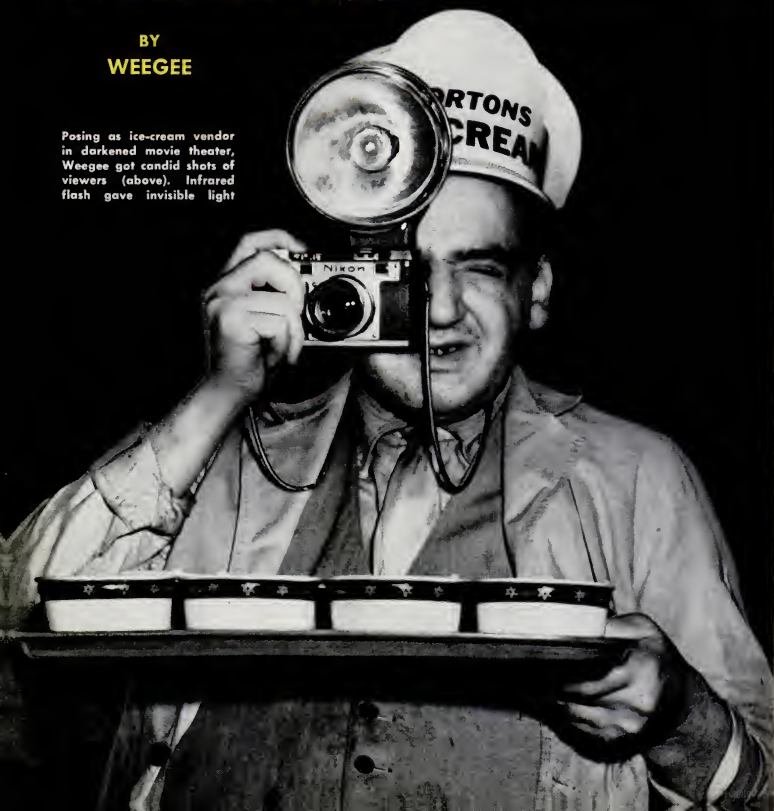


Everything that goes on at the gate is observed by camera at door of office building. Here a visitor is communicating by phone with the office. Coming or going, each visitor has to be identified. At left, driver remains in car while phoning

Here's Fun From My Bag Of Camera Tricks

BY
WEEGEE

Posing as ice-cream vendor in darkened movie theater, Weegee got candid shots of viewers (above). Infrared flash gave invisible light



MANY AMATEUR PHOTOGRAPHERS spend a lifetime taking pictures of baby's first teeth or Aunt Minnie at the beach. This is a shame, because photography offers more exciting things than that! The photographer who keeps trying new stunts and techniques is the one who achieves the most fun and satisfaction from his hobby.

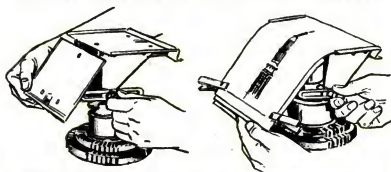
Over the years, I seem to have gained a degree of fame—or infamy—from my irreverence for the "classic" shot, which looks like a duplicate print of 10,000,000 others. That doesn't mean I haven't aimed my camera at such weary scenes and portraits. I have. But with the help of a mirror slider, a few darkroom gadgets or techniques, and other simple devices, I've managed to turn these dull pictures into hilarious caricatures and artistic studies.

I've put an elephant on the Capitol dome. I once wiped the famous smile off the Mona Lisa's face and made her sneer instead. I have a shot of the Sphinx howling. I've photographed two-headed Weegees, Marilyn Monroe with 10-foot legs, people in bottles, corkscrewed Empire State Buildings, and Times Square under 10 feet of floodwater on a sunny afternoon.

Until now, my methods for achieving many of these startling results were my own secrets, tucked in my personal bag of tricks. When *Popular Mechanics* asked me to unveil them for its readers I agreed, and you'll find them all on these pages. There isn't one that even the most amateur shutterbug can't achieve himself with a little extra work at his camera or in his darkroom. All are simple and satisfying.

Suppose, for instance, you have a static scene in your negative file—not good, not bad, but lacking

Printing easel sawed in half and hinged can stretch or squash a scene when film is projected on enlarging paper clipped to the bent easel. Capitol photograph at right was made this way. Easel was bent the other way to produce picture below





Weegee managed to set one parked car on top of itself by holding a tiny sliver of surface-coated mirror over one side of the lens until he got just what he wanted. The drawing at left shows how it's done. The mirror was held vertically and moved back and forth until the right position was achieved to get double-dachshund photo at the bottom

interest. It might be a gallery shot if only you could make it a little "different"—softly textured like a painting or etching. Can you fix it? You bet. This, one of my most successful tricks, is done with textured glass in the enlarger. The glass can be striated, pebble-grained, fluted, "bathroom" pattern, or other. Be sure it's colorless, or you're likely to find you've built a safelight right into your enlarger! The neighborhood glazier has leftover scraps he'll sell cheaply, and for a few extra pennies he'll cut them to fit your enlarger. Clean the glass with ammonia solution and polish it with a clean, soft flannel. Look out for fingerprints!

The glass slides into the enlarger above the bellows. Then lay the negative you've chosen (in its holder) directly on top of the glass. Check the effect on the easel. If you're not satisfied, rotate the negative holder until you get the effect you do want. Rotating the negative is particularly effective when you're using ribbed or fluted glass—every degree of rotation will change the image in a different and original way.

Naturally every negative will yield different effects—some pleasing, some caricaturing, some satirical. And the more different types of glass, the more effects you'll get. I've made as many as 50 different



distortions from a single negative.

In the hands of an artist, a photo technique like the one I've described can open magnificent creative horizons. Its forms of light and shadow remind me of the oddly attractive French and Spanish primitive painters, for no longer is the camera merely a recorder of unvarnished fact. It has become a tool in the field of abstraction.

The beautifully textured shot of Times Square on page 130 was achieved with a piece of bathroom-window glass. I found the possibilities endless. I could make fantastic caricatures of famous faces, twist the Eiffel Tower and make a corkscrew of the Empire State Building. It was while fooling with textured-glass distortions that I stumbled on another trick—performed with the aid of a hinged easel. The easel does the trick—but the effect is as though your camera had a rubber lens!

The easel is simple to make, and can be used for straight printing as well as for trick effects. I cut a standard 8 by 10 easel in half and joined the two pieces with a hinge. The back of a picture frame serves as base for the easel. Both sit atop a ball-and-socket tripod head, which is attached to a brass pipe (for height) mounted on an old camera window-display stand.

Half of the easel remains flat while the other half can be bent up or down. Thus half of the face or scene you're printing is normal, while the other half stretches . . . and stretches . . . and stretches! Of course you'll have to stop your enlarging lens 'way down to keep the whole print sharp. And when you stop so far down, you'll need an extra amount of light to keep your exposures from running into many minutes. You can get that extra light by using a No. 1 photo-flood bulb in place of your regular enlarging lamp. Be careful not to leave it on too long while focusing. It gets hot and can damage your negatives.

To print, put a sheet of white typewriter paper in the hinged easel, using film clips on all four corners of the paper to keep it in place. Focus on the part of the image that's bent, with your lens wide open. Then shut off the enlarger, stop the lens all the way down, and replace the focusing



Circus offers great opportunities for kaleidoscope. Leaping tiger becomes pattern of nine by action of V-shaped mirrors

Kaleidoscope is made by taping two long mirrors at V-angle into tube. Weegee demonstrates device's image-dividing effect



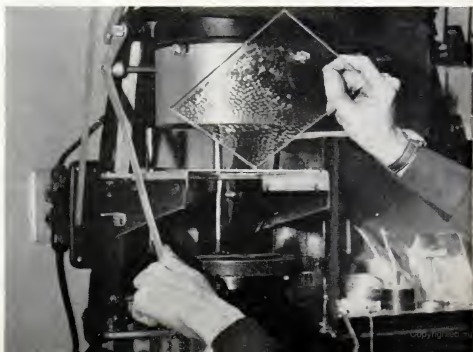


Stock negative of Times Square on a wet night was projected through pebble-grained glass to get this effect

Textured glass in enlarger gave Empire State Building "new look"



Easy way to produce distorted pictures is to slip clear textured glass into enlarger—right in the slot where the negative holder slips in



sheet with photo paper. Now make your exposure, and you've got a hair-raising print.

Distortion is great fun, as well as being startling and artistically satisfying. But other techniques provide equally impressive results.

I'm a curious person, and will satisfy my curiosity even if it kills me. A few years ago I saw a child's kaleidoscope in a five-and-ten-cent store. The silly gadget fascinated me. What would happen, I asked myself, if my camera looked through one of these mirror-and-prism contraptions—at people and places instead of the colored stones at the end of the cylinder? I took the thing apart to see how it worked and built a duplicate that would fasten on the lens frame of my camera. The results were startling! Multiple images from a single exposure, incredible patterns of people and architecture, a whole new world of photographic and artistic exploration!

Anyone can do it, and here's how: You'll need a tube of cardboard or metal, two inches in diameter and eight inches long. Then you'll need a pair of long, thin mirrors that will fit into the tube in a V shape. The mirrors should be *front-surface* (ordinary mirrors are coated on the back and give off undesirable ghost images).

Take the two mirrors and hinge them with a piece of cellophane tape on their longer edges to form a vee. The front surfaces of the mirrors should be on the *inside* of the vee. Since front-surface mirrors appear to reflect from both sides, you can determine the reflecting surface by touching a pencil to the glass. If the pencil is touching the *front* surface, its reflection will touch the tip of the pencil. On the *back* surface, there'll be a separation between pencil point and reflection. Now fit the hinged mirrors into the tube as shown in the photo on page 129. Then fasten your new kaleidoscope in front of your camera lens with tape and start snapping. Your pictures will be decorative cartwheels of repeated designs from the scene you take.

You can also use your kaleidoscope in an enlarger by placing it *inside* the enlarger on top of the enlarging lens. Focus the usual way . . . rotate the negative carrier to get the effect you want. This way you can add new life and interest to negatives already in your files. Be sure to tape both ends of the tube so as not to scratch either negative or lens . . . and use a glass carrier if you can to prevent negatives from buckling if touched by the tube.

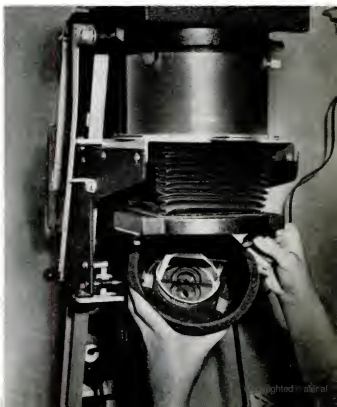
Mirrors can do remarkable things to a photo even *without* building a kaleidoscope. By placing a single mirror between a negative and lens while you're enlarging, you can stack automobiles on top of each other, grow two heads on otherwise normal people, produce rainy reflections on sunny days and a host of other weird effects.

Here again, mirrors should be either metal or *front-surface*. Your mirror should be about as long as the focal length of your enlarging lens (2 inches for 35-millimeter enlargers, 3 inches for 2¼ inches by 2¼ inches, etc.). Mount the mirror inside the enlarger bellows by slipping it into the outer rim of an adhesive-tape can, using some of the tape

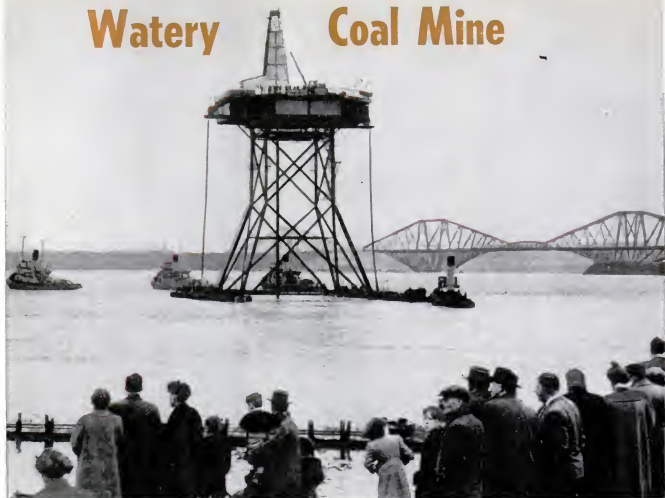
(Continued to page 228)



"Weegee self-portrait" was made when up-right mirror was taped into metal circle and placed behind the lens of enlarger



Watery Coal Mine



Coal is being drilled from the sea bottom off Scotland by a 185-foot tower rig that rests in 70 feet of water. The 5000-ton tower was recently floated into position a mile offshore in the Firth of Forth. There its steel legs were fixed to a base on the sea floor. Its drills will probe to a depth of 2000 feet for a tremendously rich coal field that is believed to underlie the inlet. British experts suspect the reserve is as

great as 6,000,000,000 tons, 15 times as much as is mined in the United States per year. A second bore hole is being drilled three miles offshore. If much coal is found, shafts from mines on shore will be extended toward the richest veins, or the coal will be mined from the water's surface. The tower has a working platform 50 feet above sea level and can withstand 80-mile-per-hour gales and 30-foot waves.



Atomic-Cannon Barrel Takes 48-Foot Ramrod

Five men and a 48-foot ramrod are needed to clean the bore of the Army's 280-millimeter cannon, now a vital tool in Western defense. The gun is designed to fire either atomic missiles or conventional shells. It is in use at the 265th Field Artillery Battalion station at Baumholder, Germany.

☛ A British motorcycle-sidecar combination is being equipped with an intercommunication set so that rider and passenger can talk through a headphone in the rider's helmet and loudspeaker in the sidecar.



KEEPING UP WITH THE ATOM



CLEAN-UP MEN at the Hanford Atomic Products Operation can put in more time on the job, thanks to an improved atomic-ray detector (see photo below). The men use caustic steam to remove radioactive material from the plant's equipment. The time they can spend on the job is limited by the amount of radioactivity. Former monitoring instruments gave an accurate reading only of the rays coming directly at the instrument. A safety factor had to be computed for rays coming in at an angle. The new monitor reacts to rays coming from various directions. This eliminates the need for an artificial safety factor, permitting the men to work longer in a given area and thus expediting production at Hanford.

☆☆☆

Countless sightseers have stood close to a large body of uranium-rich ore without knowing it. One of the largest pitchblende discoveries to be made in this country is located 1300 feet down the slope from the south rim of the Grand Canyon. It is within the only privately owned land in Grand Canyon National Park. The deposit is estimated to contain between 100,000 and 300,000 tons of rich ore.

☆☆☆

Want to buy some thorium? The government will sell it to you now, under certain conditions. Thorium is a so-called "fertile" material that can be transmuted into uranium-233, which then can be used to power nuclear reactors or to make weapons. The government now is offering to sell thorium to private industry for "peacetime applications." The price is about \$19.50 a pound.

☆☆☆

Tests of big nuclear weapons are not causing hazardous radioactive fallout, according to Dr. Willard F. Libby, Commissioner of the Atomic Energy Commission. The greatest long-term danger in fallout is strontium-90, an isotope that seeks bones and can cause bone tumors. However, the total released to date is very far below the amount calculated as the maximum permissible concentration.

Doctor Libby also made a "low" estimate of \$210,000,000 as the potential savings to American agriculture each year through the use of atomic radiation. Tracer elements are showing farmers how to make better use of fertilizers. Radiation is also being used to cause hereditary changes in crops, resulting in disease-resistant strains.

☆☆☆

Rubber has been vulcanized without heat and without the addition of sulphur by irradiating it with short gamma rays of cobalt-60. The process was discovered at Wright-Patterson Air Force Base.

☆☆☆

Ultrasafe vaccines, including those for protection against polio, may be possible by "killing" viruses with high-intensity gamma rays. This has been suggested by Dr. Russell T. Jordan of the City of Hope Medical Research Institute, Duarte, Calif. Heat, chemicals and ultraviolet light now are used to inactivate viruses. Gamma-irradiated viruses have resulted in experimental vaccines more stable and of higher potency than those "killed" by chemicals.





Sahara Sailboat

To sail across the Sahara Desert is the aim of writer-photographer J. Mortimer Sheppard, who has obtained a wheeled sloop for the venture. His route, from southern French Morocco to Dakar in French Senegal, is 1710 miles long. Conventional sand yachts, used for racing on tideland beaches and salt flats, have widely spaced front wheels. Because of road towing problems, Sheppard's craft is narrow. To add stability on the desert run, an "outrigger" wheel on an extension bar was added.

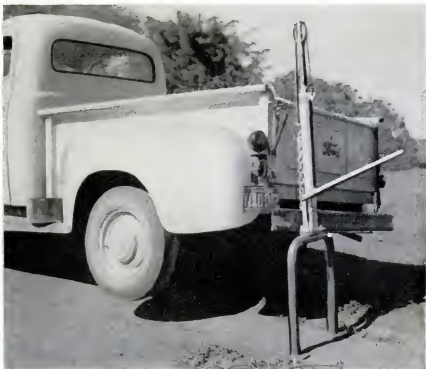
TV Camera Cuts Testing Time

De-icing tests on the Bristol Proteus turboprop engine, the power unit for Britain's airliner, required only 20 hours in place of the usual 200, thanks to a small television camera mounted inside the engine. Engineers, watching a 14-inch screen in the cockpit, were able to observe the icing characteristics of the engine in flight. This eliminated many test flights interspaced with ground checks.

Farmer's Jack-of-All-Trades Pushes or Pulls Upward

With 8000 pounds of direct lift, a new hydraulic jack can be used to perform heavy jobs on the farm. The jack has interchangeable heads—a hook and a pulley—so it can be used either to push upward for overhead support or to pull upward, as in

dumping a grain wagon. The jack stands on two legs and weighs only 59 pounds. The lifting range is 50 inches. It can be used to lift tractors, remove fence posts, raise small buildings, support overhead beams and lift farm implements.



Dispatching ancient autos is the job of a big tractor shovel at an East Rochester, N. Y., scrap yard. In one blow, the huge shovel squashes the car into a more compact hunk of twisted metal. The machine then picks up the remains and deposits them in a truck bound for a salvage depot.



Shovel Hits 'Em



... and Hits 'Em

Shovel slams down on roof of car from which motor and other mechanical parts have been taken

Veteran of many traffic battles is really battered now as it nears consignment to scrap heap

Wooden Works for Grandfather's Clock Assembled From Kit

You can build your own clock with a kit that includes all parts and instructions. An unusual feature of the clock is the fact that all parts except the weight, its chain and a pendulum bob are made of wood, mostly maple. Even the smallest, precision-cut gears are wooden. The hands can be carved to suit individual taste, and the 12-inch wooden face can be painted or varnished to fit a particular color scheme. The clock is wound for a 36-hour period by pulling a weight attached to a ratchet gear. The 19-inch-high clock may be hung from the wall or built into a cabinet.





Swiss P-16 Jet For Short Runways

When it came to procuring jet aircraft, the Swiss air force faced a serious problem, since none of the jet fighters being produced in the world could land on the tiny airports nestled in the Alps. Finally, they had the Swiss P-16 designed with a very thin wing for high-speed performance and an unusual leading-edge flap which changes the profile of the wing when extended. The larger wing area provided by the flap permits low-speed landings, enabling the P-16 to land and take off on a 2600-foot runway. The craft is intended for use both as a high-speed interceptor and as a ground-attack plane. The prototype models are now undergoing flight tests.



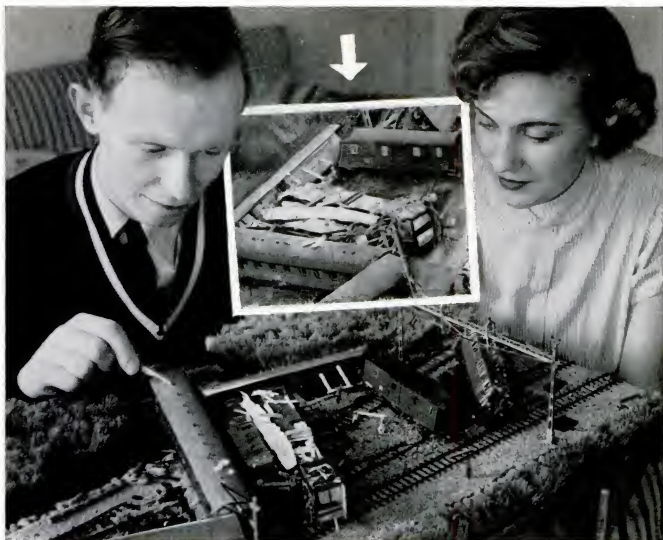
Flap on leading edge of wing extends to increase area for slow landings

Over-the-Carpet Dance Floor Converts Parlor Into Ballroom

You can transform your parlor into a ballroom with a prefabricated dance floor that is quickly placed over the carpeting. The dance floor is made up of squares of pressed wood bordered by metal tongues

and grooves. A special tool locks the sections together. The squares, which come in 4-square-foot and 16-square-foot sections, are black on one side and brown on the other for various designs in the floor.





Instead of building model trains, Swedish journalist Sonny Hultberg builds scale-model railroad accidents. His first project, which took 500 hours to complete, shows a spectacular passenger-train wreck that actually occurred a year before. Hultberg, with the aid of newspaper photographs, was

Model Railroad Wreck

able to duplicate every feature of the wreck scene. A hole in a roof that rescue workers cut to enter a car is visible, as is a broken rail that had pierced the side of the car. The small windows of the cars are partially broken. Road bed, rails and even reeds are all faithfully duplicated.

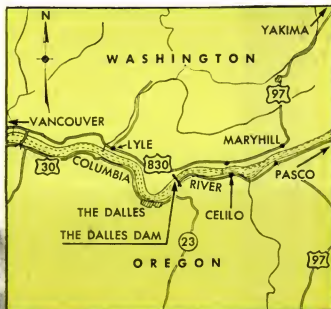
Plastic Cutout Alerts Drivers

Drivers are warned of school zones by a giant plastic figure cut out of plastic and cemented to the pavement. The figure, a silhouette of a running boy, is about 10 feet tall. The white plastic sheeting used for the cutout is impregnated with glass beads for longer wear and reflective qualities. An additional visual warning is provided by a yellow ball, cut out of plastic sheeting, and placed alongside the figure.





The Dalles Dam, as it will appear when completed. Ship lock is left of main spillway, powerhouse at right



THE DALLES DAM TO SUBMERGE

Upstream view of single-lift navigation lock, 86 feet wide by 675 feet long, cut through on the Washington shore of the Columbia River. It will provide a minimum 15-foot depth of water over the sills at the maximum drawdown of the reservoir pools





Spillway of The Dalles Dam nears completion. Reservoir will back up 25 miles, cover 11,000 acres with water

FAMOUS INDIAN FISHING SPOT

By Thomas E. Stimson, Jr.

HYDROELECTRIC POWER equal to 2,500,000 tons of coal or 9,000,000 barrels of oil will be produced annually at The Dalles Dam now under construction on the Columbia River. Fourteen generators having a capacity of 1,092,000 kilowatts are to be installed in a powerhouse almost half a mile long, as tall as a 12-story building and with an area equal to that of 15 football fields.

The new dam is upstream from Bonneville Dam and is the sixth of 12 dams that ultimately will convert the Columbia into a series of giant steps leading all the way to the Canadian border. The Dalles Dam is to be 8500 feet long and 125 feet high at the spillway. Its reservoir will cover 11,000 acres, creating slack water all the way upstream to the site of the proposed John Day Dam, 25 miles away.

Spectacular Celilo Falls where Indians have speared salmon for

Famous Indian salmon-fishing spot at Celilo Falls, Ore., will disappear after The Dalles Dam goes into operation





Most of the salmon caught by the Indians was sold to a cannery, which erected this cableway to take the Indians to their fishing site free of charge. Cableway was dismantled during high water each year

centuries will be submerged in the new reservoir. In compensation for their fishing rights, the U.S. Army Corps of Engineers under whose auspices the dam is being built is paying millions of dollars to Indian tribes in the area.

In addition to the powerhouse and spillway the new dam contains a navigation lock large enough to handle an eight-barge tow, and two fish ladders and a fish lock that will enable salmon to move upstream. Cost of the dam is in excess of \$270,000,000. Its first power units will be placed in service in 1957. ★ ★ ★



Celilo Indian fishes with safety line tied around him, for a swim in these churning waters would mean death





Portable Paint Drier Uses Infrared Coils

You can dry paint quickly with a portable infrared unit made in Germany. A blower is housed in the hand-held unit behind circular quartz coils. The infrared rays combined with the blast of warm air allow faster, more even coats of primers, surfacers and enamels, and dry synthetic enamels in six to eight minutes. The 4½-pound unit has a capacity of 2500 watts.



Magnifier Permits Focusing On Silver Grains of Negative

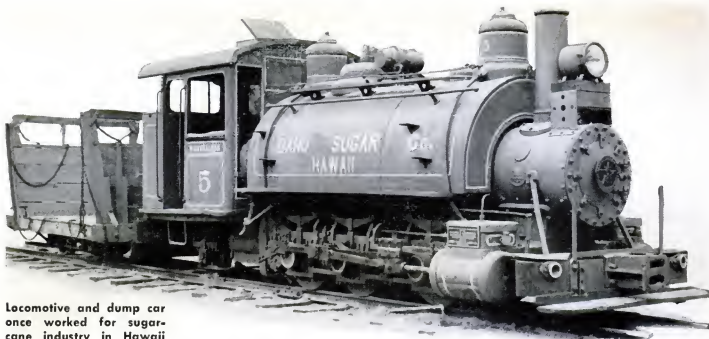
Ultrasharp enlargements are assured by a focusing device that magnifies the image so greatly the photographer can focus on the silver grains of the negative. The device does not use a ground glass. Instead, it uses the mirror-and-grid principle. This is said to produce such a bright image that it can be viewed in a brightly illuminated room instead of a darkroom.

Wheels, Wheels and More Wheels Add Up to French Trailer

It's a good thing the tires on a mammoth French trailer are solid rubber—it would drive a man crazy checking air pressures if they were pneumatic. The long trailer

comes in two parts with 12 axles on each section. A 165-ton dynamo rides in a cradle suspended between the two trailers as it is transported through Paris.





Locomotive and dump car once worked for sugar-cane industry in Hawaii

Paradise for Casey Jones, Jr.



Old-time electric locomotive did its share in restoring San Francisco after fire of 1906. Below, locomotive had streetcar-type body so it wouldn't scare horses



EVER KNOW a youngster who didn't sometime or other want to be an engineer? Kids in Los Angeles can get a real taste of railroading at Travel Town in Griffith Park. There the city's Park and Recreation Department has made it possible for boys and girls to play engineer to their heart's content.

In this unique town, several old iron horses that the railroads had turned out to pasture have been put back into service. A potential Casey Jones can climb up the big wheels, slide over the cowcatchers and clamber up on top to polish headlights and see what makes the bells ring. He can climb into the cabs and pull whistle cords and manipulate brake and throttle levers.

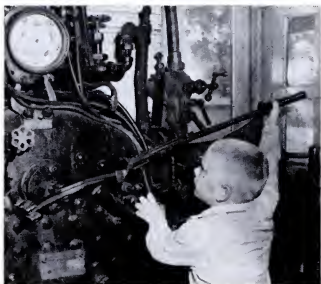
Real Train Ride

If small-fry visitors grow tired of the stationary engines they can take a ride on a real train. The two cars and the engine came from the Oahu Railway and Land Company in Hawaii, and roll along one mile of track set up in Travel Town. Visitors board the train at a real station, donated by the Union Pacific Railroad. The station has an historical background, as it came from Promontory, the site where the golden spike was driven, joining eastern and western lines.

Other types of trains haven't been overlooked. There's a powerful electric locomotive which did its share in restoring San Francisco after the earthquake and fire of 1906. Another exhibit is the first interurban electric car that operated between Los Angeles and Long Beach. ★★



Favorite spot for youngsters is top of a locomotive where they find out how whistles whistle and bells ring



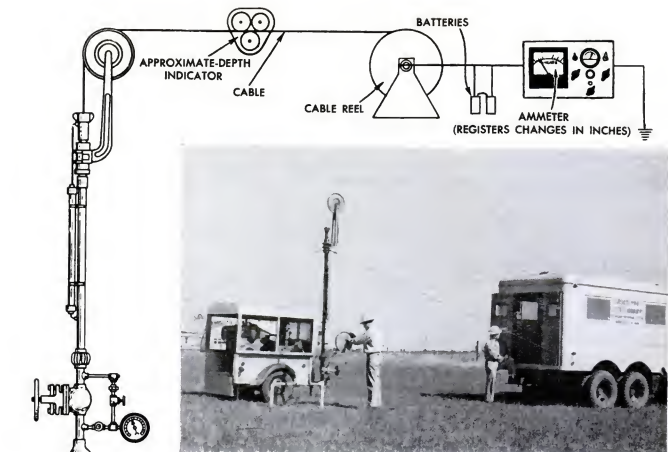
Small boys ask unending questions: What does this do? What does the dial say? How fast will she go?



Who says railroading is for men only? These girls have just as much fun in the engines as the boys

Engines galore, freight and passenger cars, stations and even an old cannon lure youngsters to Travel Town

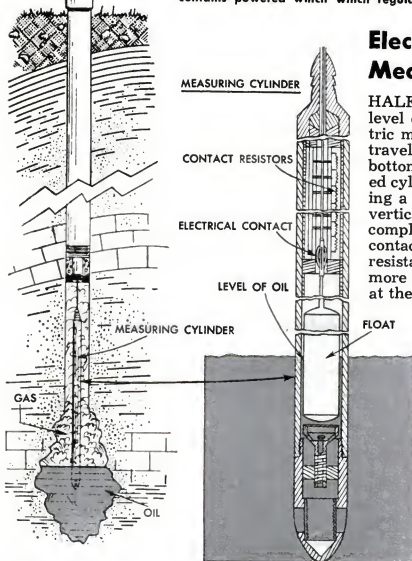




Mobile equipment at well head is used to check condition of well. The truck contains powered winch which regulates cable to keep cylinder at right level

Electric Oil Gauge Measures Well Level

HALF-INCH CHANGES in the liquid level of an oil well register on an electric measuring system. Electric current travels down a cable to a gauge at the bottom of the well. A float inside a vented cylinder rises with the oil level, causing a contact to slide up and engage a vertical series of contact resistors. This completes the circuit. The higher the contact is pushed by rising oil, the less resistance there is in the circuit and the more current flows back to an ammeter at the well head. This tells the operator the height of the oil level in the measuring cylinder. An "automatic pilot" measures the returned current and lowers or raises the measuring cylinder to keep it at the liquid level. The manufacturers of the unit state that it is the first accurate device for finding and following the liquid surface of an oil well. It replaces the standard echo meter.



Drawing shows how installation looks in a typical well. Cutaway of measuring cylinder is detail of main drawing



Screen house is ideal for outdoor eating or entertaining. Full construction details start on page 165

Get Ready for Outdoor Living

FROM MAINE to California and from Minnesota to Alabama, thousands of families are taking up outdoor living for many months of the year. Patios, eating areas, places for play and relaxation are transforming back yards throughout the nation. The following pages point out some easy and inexpensive ways to get ready for outdoor living. With a few flagstones or a pile of bricks, a family working together can build a patio in a couple of week ends. Simple lamps and a bit of ingenuity extend outdoor-living hours into the night and create spots of real beauty. Portable grills make cooking out a cinch and as to yard furniture—you can make a lot of it yourself at low cost. ★ ★ ★

Have Fun!



Entertain!



Relax!

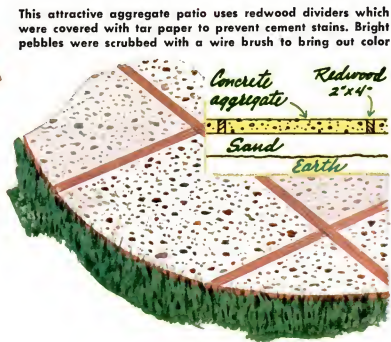




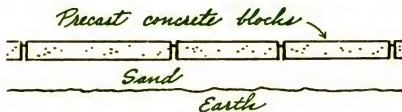
Eight Kinds of Patios

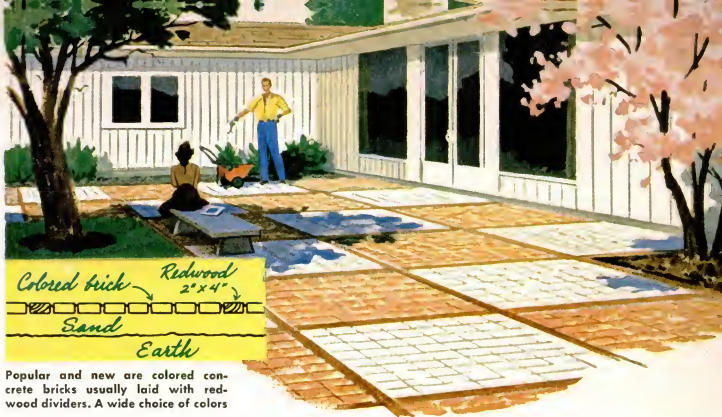


Brick patio is laid in a grid constructed of 2 x 4s over 2 in. of sand. Bricks should be flush with frame



If you want a personalized patio you can cast concrete blocks yourself and impress designs of family interest. Forms of 2 x 2-in. lumber provide 2-in.-thick blocks. Designs are colored with concrete paint if desired. Use premixed concrete to make them





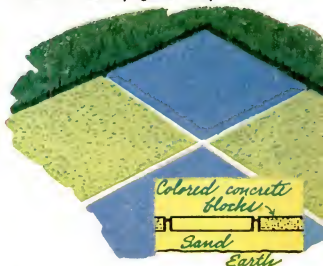
Popular and new are colored concrete bricks usually laid with redwood dividers. A wide choice of colors

You Can Build Yourself

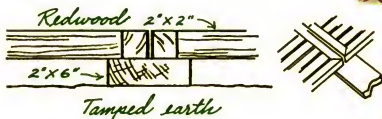


End-grain blocks of redwood give long service. The blocks are 4 in. thick and laid over 1 in. of sand. One-half inch spaces between the blocks are filled with sand and are then settled with water. Patio is edged with 2 x 6 strips

Unusual effect is achieved by making the blocks of colored concrete in individual forms and then laying over tamped sand



Redwood deck or patio provides good drainage and may be used on sloping sites where level must be raised to meet level of house floor. Deck squares can be laid in parquet pattern (as shown) or parallel strips





Courtesy of General Electric

Plastic screen illuminated from behind adds to effect of beautifully lighted patio and landscaped borders

Homemade lighting fixture over table was made from lamp and frame covered with a translucent material

LIGHT UP THE OUTDOORS

HOMES ARE WELL LIGHTED today—indoors. Outdoors, a single glaring spotlight or a feeble porch light is too frequently the only source of illumination for patio or landscaping. At sundown, driveways and walks become murky traps for the unwary and the flower borders and shrubs on which you spend months of care are seldom anything but a black blob when the stars come out.

This needn't be. You can inexpensively transform the most ordinary yard into a place of beauty at night. You don't need complicated plans or layouts. Just borrow as many extension cords as you can find. On a dry night, use the cords to try various lighting arrangements with different lamps and at different places. An evening of lighting experiments will reveal exactly what you need in your particular yard.

With the bulbs and fixtures available today, you can obtain excellent results. Attractive nonrusting indoor fixtures can be used under covered roofs. A plastic terrace screen becomes a huge lighting fixture by just placing spot or flood lamps behind it. The popular plastic bubbles not only give soft illumination but provide a reading light below by using the "R" bulbs inside. PAR spots or floods can be hidden on a roof to reveal trees or the lawn. Fluorescent



tubes (and outdoor Christmas strings) will bring a garden path or outlying fence into the nighttime scene. A small, low light at the top of steps will softly outline them for the visitor. A reflector bulb over a hanging screen of heavy fabric or translucent plastic above the barbecue table gives delightful dining illumination—and with freedom from insects. Another possibility is to clamp an upward-shining fixture to the stand of a table umbrella. The umbrella reflects light down on the table. Mushroom fixtures, available in a wide variety, are excellent wherever a fixture is exposed and for portable stands out on the lawn.

An important thing to remember in outdoor lighting is that most higher-wattage bulbs need some protection because the hot glass can explode when it is splattered by rain or snow. Fixtures 1, 2, 3 or 4 (see illustration above) take care of this problem. The PAR-38 bulbs need no protection, but in some places you may wish to shield them as in 5 or 7 (see illustration above) to eliminate glare.

For permanent wiring of lights, you have three choices: portable cords, overhead and underground wire. Of course, you may wish to use more than one type. Portable cords can be quite satisfactory for outdoor lights. Use an S, SJ, SJT, SO or SJO type of cord to withstand the weather. For overhead wiring, use type WP, RW or TW wire to run between buildings or posts—best supported about every 15 feet. Conduit should be used if the wires are lower than eight feet above ground. Underground wiring formerly had to be in conduit or lead cable. The new plastic cable is considerably less expensive. Type USE or UF can be buried directly in the ground. Place sand or gravel around the buried wire for drainage and a board over it to protect from a chance shovel. Run the wire up out of the ground to fixtures or up the sides of trees through short lengths of conduit. The National Electric Code allows 20-ampere fusing on an outdoor circuit, but check with your local building inspector. Also measure the circuit and find out what wire size is required with the fusing. ★ ★ ★



1. Bullet reflector for A and R bulbs; 2. Mushroom reflectors for A bulbs; 3. Plastic bubble for A and R bulbs; 4. Glass over fluorescent tube; 5. Homemade glare shield for PAR-38; 6. Underwater unit for A bulbs; 7. Clip-on shield for PAR bulbs



Plastic bubbles light patio, PAR-38 floods light the trees

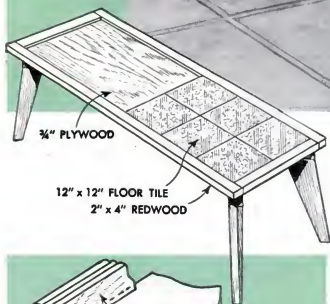
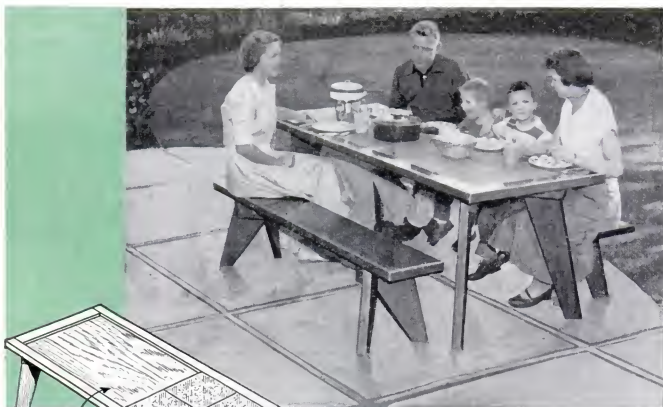


A-type ordinary bulbs from 15 to 200 watts. If over 40 watts should be shielded from weather

R-type reflector lamps from 75 to 150 watts are used in spot or floods. Shield from the weather

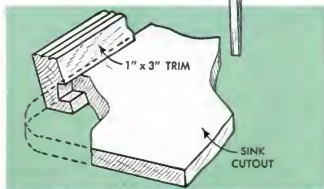
PAR-38 outdoor reflector lamp, 150 watts, for spot or flood. The glass needs no protection

PAR-46 and 56 reflector lamps, 200 and 300 watts, spot or flood. Need special sockets, protection



Better Tables For Your Patio

THESE PATIO TABLES are well designed and easy to build yourself. The barbecue table (see details at left) has a top made of 12-inch floor tile which is resistant to both weather and hot pans. The tiles can be laid loose or cemented. Legs of the table can be removed for winter storage. The small tables below are made of inexpensive "sink cutouts"—plywood with counter-top plastic bonded to the tops. The legs are metal and easily attached. Tiles for the barbecue table above can be made from the same material as the small table tops for matching patio furniture.

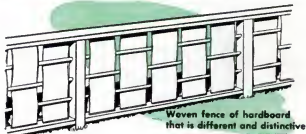




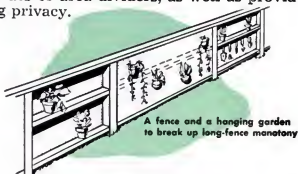
Glass-fiber panels woven around dowels form a fence that both enhances property and serves as wind screen

More Than a Fence...

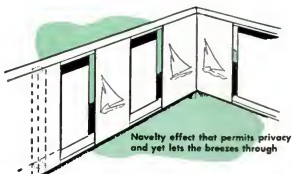
SINCE THE IDEA of living outdoors has taken hold, fences have become more important. They no longer merely enclose an area, but now are integrated right into the house design and landscaping layout. And they often do duty as wind screens, sun shades or area dividers, as well as providing privacy.



Woven fence of hardboard that is different and distinctive

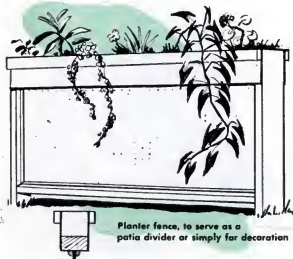


A fence and a hanging garden to break up long-fence monotony



Novelty effect that permits privacy and yet lets the breezes through

If you're planning a fence for your home, let these sketches stimulate your imagination. In addition to a design that is novel and useful, look for unusual materials to get a decorative effect. The fences shown use standard and perforated hardboard on regular fence frames; glass-fiber panels would serve, too



Planter fence, to serve as a patio divider or simply for decoration



Workbench for the outdoor cook decorates and divides the patio

Portable Grills for Every Pocketbook



Deluxe wheeled grill with electrically driven rotisserie can barbecue a large turkey. Serving shelves fold out. On top is warming oven. Brazier adjusts. Doors open to service fire.

Big Boy, Inc., 59 E. Orange Grove Ave., Burbank, Calif.

Simple, inexpensive unit consists of bowl, grill and tripod. It can be set up quickly anywhere.

Bar-B-Bowl, 175 Fifth Ave., New York City 10



MORE AND MORE portable grills are appearing in American back yards—and with good reason. Compact and inexpensive, they produce excellent results, can be moved to any part of the yard and are easily stored. The basic unit consists of a grill over an iron fire pot on legs. Additional refinements include wheels for the larger units, collapsible features, grills that move up and down to keep the food a proper distance from the fire and hoods that keep out wind and reflect heat. Rotisseries, warming ovens for rolls and side pockets for brewing coffee and heating additional food are on the more deluxe models. The units shown here range in price from a few dollars to slightly over a hundred.

★ ★ ★

Folding grill is easily stored when not in use. It is lightweight, easy to clean and move about.

Union Steel Products Co., Albion, Mich.



Suitcase model features steam-driven rotisserie, easy portability, folding legs. Weight: 32 pounds.

Buch Mfg. Co., Elizabethtown, Pa.



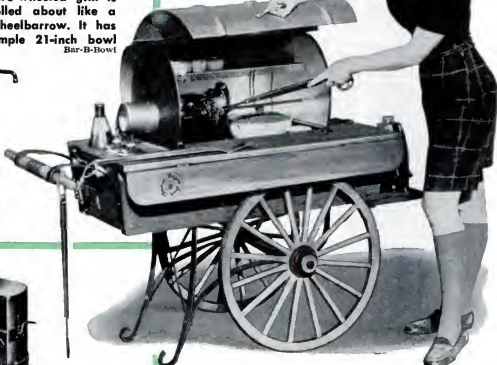
POPULAR MECHANICS



Two-wheeled grill is rolled about like a wheelbarrow. It has ample 21-inch bowl
Bar-B-Bowl

"Covered wagon" grill has copper hood to reflect heat, rotisserie, warming bin, side cooking units

George Henry Co.,
Morton Grove, Ill.



Large two-wheeled unit features a cylindrical hood, triangular base and hand-operated spit. Crank at the base adjusts height of the grill
Big Boy

Large tripod unit cooks meat for several. Hand crank adjusts grill height. Unit is easily moved
Big Boy



Bucket grill has a burnproof porcelainized fire pot that is removable. Air enters through holes in base and rushes up around sides of pot to create draft
Hamilton Metal Products, Hamilton, Ohio



Battery-operated rotisserie is featured on unit that sits on a picnic table or in an unused fireplace. The long, low grill holds several steaks, many hamburgers
Barba-Charo, Ryder-Elliott Inc., 3227 Fowler St.,
Los Angeles 63, Calif.





Courtesy General Sportcraft

Tether Ball

Tied to the top of a 10-foot pole is a strong cord, with a rubber ball at the opposite end. Opponents try to wind the cord around the pole in opposite directions by hitting the ball with their paddles. Look easy? Try it, and you'll find yourself in one of the wildest, most strenuous games you've ever played! Above is commercial equipment, complete with collapsible pole which you can find in sports stores. At left is home-made version consisting of two-by-two pole with attached stand. Projecting from bottom of the pole is a spike that fits into a socket in lawn or driveway

Have Fun in Your Back Yard!

THERE'S A BACK-YARD SPORT or game for anyone in the family, from the smallest toddler right on up to Grandpa. And where can you find more bitter or better rivals than your own friends and neighbors?

Some of the older games, such as horseshoes, badminton and shuffleboard, require a court or special playing area. Six of

these court layouts are shown on page 157.

On these pages are some of the newer games. In many cases, no ready-made court is required, and you can put up or take down the equipment at a moment's notice whenever an opponent appears.

So choose your game, from the most strenuous to the most relaxing, and find excitement in your own back yard!



One-Hole Golf Course

Here's fun for the confirmed golfer and a good chance for youngsters to learn the fine points of play on the green. A bent-grass lawn serves best, but any good stand of grass will do. Wait until the grass is long. Then, using a compass made of a string at least 10 feet long, mark off a circle with a small amount of lime. Bury a tin can in the middle of the circle. Cut the grass of the putting green close, but leave longer grass around the circle. From other parts of the lawn you can chip onto the green, then practice your putting game. The grass on the green should be well fed, watered and closely cut all season to keep it in perfect playing condition



Courtesy General Sportcraft

Tamburelli

This game is as fast as badminton, but also is satisfyingly noisy. The "racket" in this case is a wooden ring covered with a tightly stretched disk of thin leather. The game is played with a shuttlecock similar to a badminton "bird." Each time a player hits the shuttlecock he's rewarded with a good solid "bong." If you already have a badminton court, you can play Tamburelli on it without any alterations. The game however, can also be played without a net, but with rules similar to badminton rules. Another variation is to use a solid sponge-rubber ball instead of the shuttlecock, which speeds the game considerably. When the ball is used, the game can be played against a wall like handball



Fi Fa

Imported from Germany, this game requires no court and is not as strenuous as most yard games. Kids like it, and it's ideal for adults who want a little exercise to settle that back-yard barbecue. What's more, one person can enjoy practicing by himself. Each player is armed with a cone-shaped catching net. The ball is an ordinary table-tennis ball. One player drops the ball into his cup and pulls a tripping lever which operates a spring at the base of the cup. The spring flips the ball through the air toward the other player, who tries to catch the ball in his net. Then as quickly as possible he aims his own net and pulls the trigger to return the ball. Player who misses catch loses point





Courtesy General Sportcraft

Bat Tennis

Here's another tennis-type game that can be played on a regulation badminton court. The equipment consists of four solid wooden paddles or bats and a solid sponge-rubber ball that is heavier than a tennis ball. The net is placed lower than a badminton net. Rules, in general, follow tennis rules and the scoring is the same. The advantage of the game over regular tennis is that it is played on a much smaller court and even a duffer can have fun. Don't look for a slow game, though. This is strenuous exercise, whether the game is doubles or singles.



Courtesy General Sportcraft

Banball

You play with a "coptive" ball, which eliminates a lot of chasing and keeps the kids out of the streets. Solid rubber ball is attached to an anchor block with a long elastic cord. Opponents stand side by side and alternately bat the ball, which rebounds and comes whizzing back, jerked by the elastic. You can play Banball by yourself, just for the exercise.



Boccie Balls

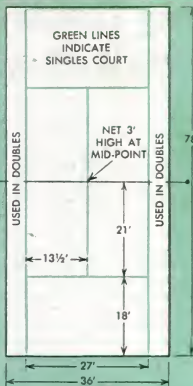
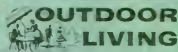
One of Italy's most popular games, Boccie Balls is a variation of bowling on the green. It's a highly competitive, not-so-strenuous game that can be played by all age groups. All you need, in addition to the balls, is a stretch of smooth lawn. Recommended length of the court is at least 60 feet. Each

player (or team) rolls four large balls. A smaller ball called the jack is rolled to the far end of the court, and the object of the game is to roll the large balls as close as possible to the jack. Half the fun comes in trying to knock your opponent's counters away from the jack or knock the jack aside.

Courtesy General Sportcraft

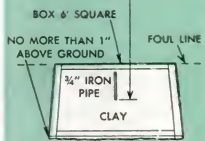


COURT LAYOUTS

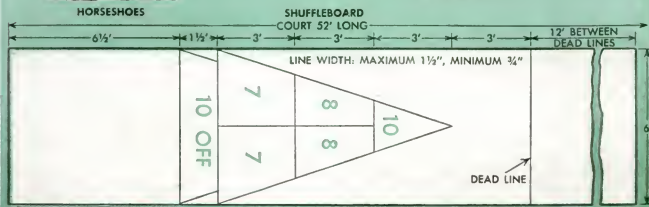
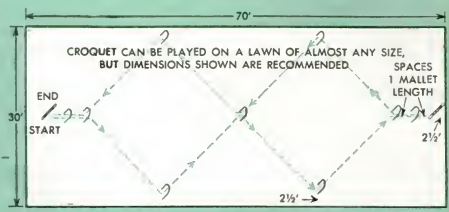
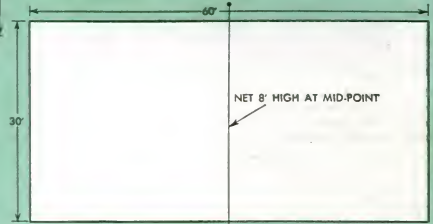
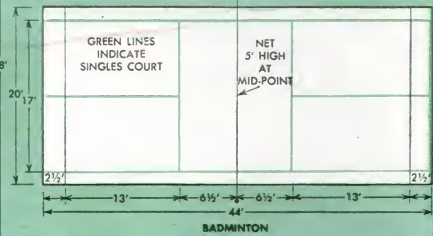


TENNIS

40' BETWEEN STAKES



HORSESHOES





Rolling cupboard is fitted with every tool and utensil the backyard cook is likely to need. Having everything conveniently stored in one cabinet saves many trips between patio and kitchen. Each cupboard should be equipped to suit owner's needs

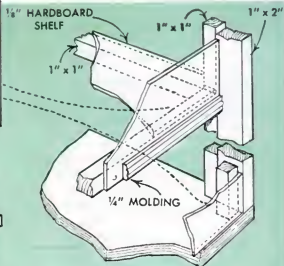
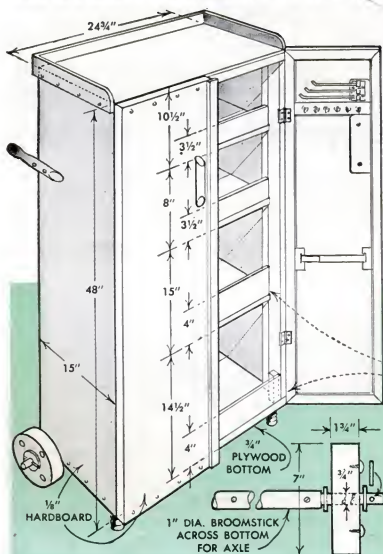
Rolling Cupboard For the Barbecue

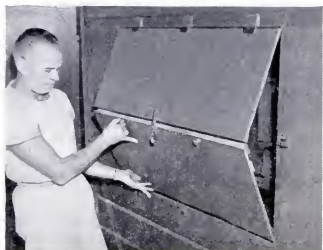
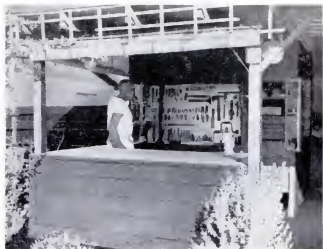
WITH HUNGRY GUESTS arriving and the charcoal glowing hot in the barbecue pit, the back-yard cook has to be prepared to go into his act. And he will be, with this rolling storage cupboard to accompany him to the scene of the "crime." The cupboard contains everything he needs except cooking talent. There are dishes, utensils, towels, apron, condiments and mitts, handy for quick use.

Materials used in construction of the cupboard are pine or redwood scraps, $\frac{1}{4}$ -in. plywood, and $\frac{1}{8}$ -in. hardboard. All of the metal fittings are inexpensive and can be obtained at the hardware or five-and-ten. The total cost of the finished cupboard can be kept under \$5.

Top and bottom pieces are $\frac{3}{4}$ -in. plywood, and the shelves are hardboard nailed to supporting frames made of 1 x 1-in. stock. The front legs on the original cupboard were cut from chair rungs, but could be sawed from a dowel or broom handle. The wheels are wooden disks with metal washers attached to each face. Other construction details are shown in the illustration.

To finish the cupboard, give it two coats of semigloss enamel in your favorite color. Use a complementary or contrasting color on the wheels and trim to complete the job. The last step is attaching metal fittings.





Sam Oldham of Phoenix, Ariz., shows off his outdoor workshop which locks up like a bank at night. Doors fold down over the tool cabinet in center. Catches in photos at right hold doors and saw out of the way

Workshop Moves Outdoors

MANY A WORKSHOP FAN has wished he could move some or all of his projects to the outdoors during good weather. Sam Oldham, Red Cross safety director in Phoenix, Ariz., solved this problem by building an outdoor workshop behind the carport of his new home. A roof and bamboo curtains provide protection against the weather and ingenious cabinets lock up the tools in a jiffy.

Oldham used plywood to build the big tool cabinet which projects a foot into the carport storage shed. Folding doors, hinged in the center, are lifted up when the cabinet is in use. A wooden catch holds the doors open. All tools are neatly aligned with brackets made from coat hangers and metal strips. The cabinet holds 65 tools without crowding. His saw is held in place with a wood fastener which is turned to release it.

Smaller cabinets on either side of the big one are arranged with shelves and drawers to hold a variety of drills and small tools. Oldham devised a bar to close the side-cabinet doors which cannot be opened

when the big folding middle door is locked.

At one end of the shop, Oldham built shelves on which he has placed cigar boxes to hold nuts, screws and bolts. His six-foot bench is less than four feet from the storage cabinets. One side of the working surface of the bench lifts up and a power saw is quickly put into position. The saw platform is set into the steel frame of an auto seat and the motor rests on two U-bolts and swings under the table. A comfortable seat also swings out from under the workbench. Oldham has made holes for inserting his drill press on his workbench with a plate underneath to hold the press securely.

Other features of the workshop include a movie screen which can be rolled down for night showings on the adjoining patio, a hidden radio and a clock which can be swung around to be viewed from either the shop or patio. The workshop is lighted by fluorescent fixtures. Oldham has put in numerous electric outlets in the shop and all are connected to a main switch which turns off all current to the shop.



H. Leslie Hill Enterprises, Dallas, Tex.

Doors of living room and master bedroom open onto patio which more than doubles living area of this house

PLAN FOR INDOOR-OUTDOOR LIVING

LEADING ARCHITECTS and designers, such as Cliff May and Chris Choate of Los Angeles, are planning houses that integrate indoor and outdoor living—you're not really sure where one leaves off and the other begins. With glass walls and doors and an extension of shading devices or overhang, they achieve a feeling of unity with patio areas and inner rooms. Access between the indoor and the outdoor living rooms is a vital factor in the planning.

Carefully planned outdoor areas give a feeling of spaciousness to a small home

that is usually associated with houses costing over \$25,000. The panelized Cliff May house on this page has elbow room to spare and was sold in Dallas for \$14,950. Its floor area is 1346 square feet, but the patio more than doubles the living space.

Privacy for outdoor living space is another important factor in the planning. This is easily effected with good landscaping and proper use of fences. Areas for play, quiet relaxation, eating and entertaining should be carefully planned. Also, patio colors should blend with adjoining interiors.

Integration of indoor and outdoor area is shown in photo. Floor and patio plan is for the house above



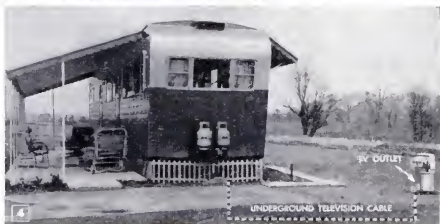
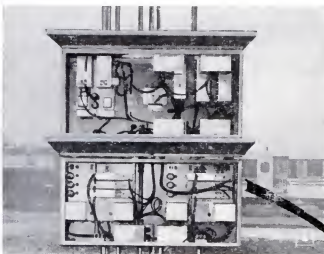
RADIO *Television* ELECTRONICS

TV for Trailers

TO ELIMINATE the unsightly antenna jungle and still provide best possible TV reception for its tenants, a mobile-home community on the outskirts of Philadelphia is equipped with this master-antenna installation. The system not only improves the park's appearance but also provides better reception than could be obtained with individual roof-top antennas.

Six separate channels, three from New York and three from Quaker City, are received by individually tuned, high-gain Yagi antennas atop a 50-foot mast, Fig. 1. Separate transmission lines from each antenna lead to a control box, Fig. 2, mounted at the bottom of the mast. Here, the individual signals are amplified, mixed and distributed, via underground cable, to a series of pint-sized TV outlets, Fig. 3, installed beside the a.c. power sources near each camp site. An additional length of underground cable leads from each outlet to the individual trailers, Fig. 4.

On opening day, the play area was monitored by a TV camera broadcasting over an assigned closed-circuit channel. This enabled mothers to watch the children from any TV-equipped trailer in the park.





CAR RADIO DOUBLES AS PA SYSTEM

By Byron G. Wells

ANYONE who has ever addressed a group of people, whether indoors or out, will testify to the merits of a public-address system. While indoor installations of this type are in common use today, outdoor systems are generally too expensive to be purchased for nonprofessional use. Nevertheless, such units are often very desirable for picnics, camping trips and dozens of other outdoor activities.

With a few simple wiring changes and the addition of some inexpensive parts, your car radio can easily double as a PA system. The conversion need not disfigure the radio, nor will it affect radio reception.

Essentially, the modifications consist of the addition of a control panel, and rewiring of the radio so that its audio amplifier can be used as a separate PA amplifier when desired. In this application, the amplifier input is switched to a microphone jack on the control panel, while its output is switched to a separate PA speaker.

The schematic and pictorial diagrams of the control panel are shown in Figs. 1 and 4, respectively. Figs. 2 and 3 illustrate the way in which the control panel is actually interconnected with a typical radio.

The construction of the control unit is simple. The various parts are mounted on a metal plate which, when completed, can be fastened to some convenient point on the dashboard of the car (see illustration

on page 246). The parts layout is not critical, so the mounting plate may be any desired size or shape.

Since the mounting plate acts as a common ground, it must make good contact with the bare metal of the dash. Any paint in the vicinity of the mounting screws should be carefully removed.

Careful consideration must be given to the length of the leads required for connecting the control panel to the radio and the external speaker. These must be sufficiently long to reach their designated connecting points.

When the control panel has been completely wired, remove the radio from the car and open the case to expose the various parts. Although the parts layout will vary in receivers of different manufacturers, the circuits involved in the modifications are very similar. The volume control has three lugs. One end lug is usually grounded, while the lug on the other end is connected to the last i.f. transformer with a piece of hookup wire. Disconnect one end of this wire from point A and solder lead 2 from the control panel in its place. Then detach the other end of the wire from the transformer, point B, and replace it with lead 1 from the control panel.

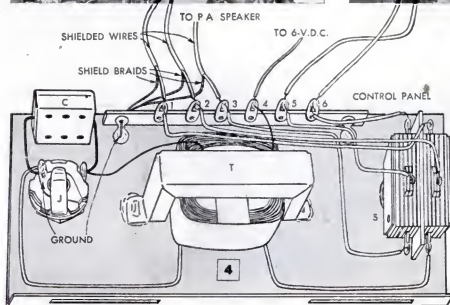
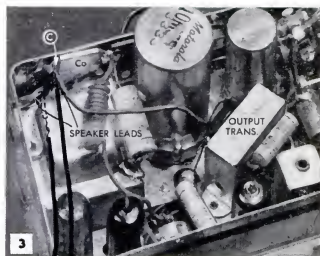
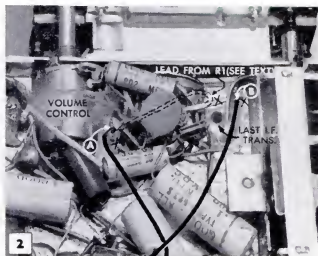
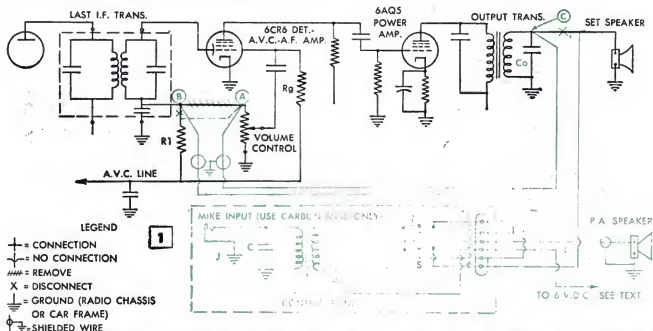
The receiver shown in the diagram, Motorola model 5M, was selected because its circuit differs somewhat from the con-

ventional. As shown in the schematic, the bottom end of the audio-grid resistor, R_g , is connected to the automatic-volume-control (a.v.c.) line. This is done to improve a.v.c. action. Since the a.v.c. resistor, R_1 , is needed to return the grid of the 6CR6 tube to ground, it must be disconnected from the i.f. transformer, as shown, and resoldered to

the volume control at point A. In radios where the bottom of R_g is grounded, this change is not required.

In order to rewire the output circuit, the ungrounded lead of the output transformer's secondary winding must be located. This lead is usually connected to a

(Continued to page 246)



LIST OF MATERIALS

J=OPEN-CIRCUIT JACK
 C=.005-MFD. MICA CAPACITOR
 T=INPUT TRANSFORMER,
 TURNS RATIO 20:1 OR GREATER
 S=D.P.D.T. TOGGLE SWITCH
 6-POINT TERMINAL STRIP
 WEATHERPROOF SPEAKER
 AND HOUSING
 CARBON MICROPHONE
 METAL MOUNTING PLATE
 SHIELDED AND UNSHIELDED
 HOOKUP WIRE
 SOLDER (ROSIN CORE)



Electronics and Hobbyists

AN APPARENT natural knack for electricity and electronics, plus an intense interest in his hobby, resulted in an expense-paid trip to the national 4-H Club Congress in Chicago for 17-year-old James G. Belleison of Sinking Spring, Ohio. The trip, sponsored by the Westinghouse Educational Foundation, was an award for winning Ohio's 4-H Club electrical program.

Of special interest was Jim's "Aspirin Box Crystal Set" shown in Fig. 1. The little radio, which incorporates a small germanium crystal detector, is fixed-tuned to receive a single station. With a 300-ft. outside antenna, and a set of earphones, Jim picks up station WLW Cincinnati, some 50 miles away, with good volume.

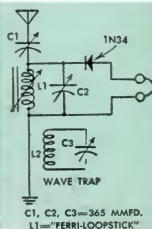
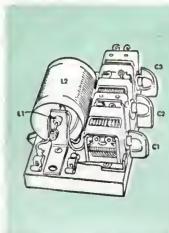
A second crystal set, somewhat more elaborate than the first, has been taken on Boy Scout and 4-H camping trips to provide entertainment for Jim and his companions. With this set, Fig. 4, a total of 19

stations has been logged, over a radius of 360 miles. When used outdoors, the antenna is strung between trees.

Deviating from "radio" Jim puts his knowledge to use by building other electronic projects. In Fig. 2, he is putting the finishing touches to an electronic photo-print timer, to be used with an enlarger.

To show how "the comforts of home" can be increased through a knowledge of electricity, Jim has designed and built the portable control panel illustrated in Fig. 3. With this panel, he controls his bedroom lights, as well as his radio and phonograph, directly from his bedside. In addition, the built-in clock timer serves as an electrical alarm clock in conjunction with a special buzzer device.

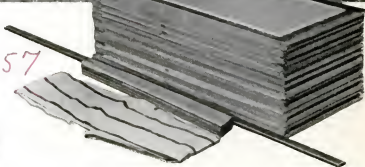
In Chicago, Jim was joined by winners of the annual 4-H electric program from 40 other states. The winners were selected from more than 100,000 participants.





WTM '57

KEEP COOL IN A SCREEN HOUSE



WITH THIS SCREEN HOUSE you can enjoy outdoor living at its best, with no worry about annoying insects or painful sunburn. Its canvas roof provides shade and its screened walls let in the breezes and keep out flies and mosquitoes. When summer is over, the house can be knocked down and stored like window screens, since the walls are made in 3 x 6½-ft. sections. The corner sections are hinged together so

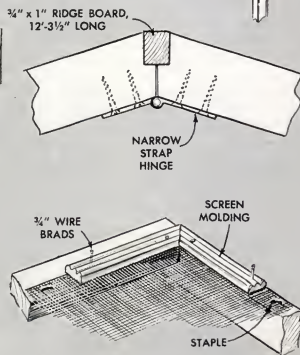
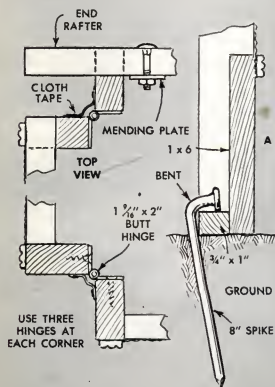
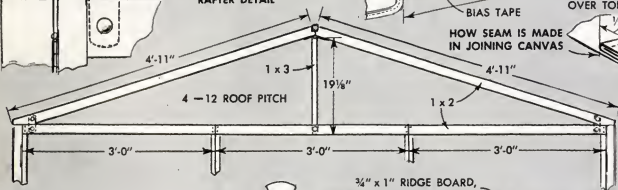
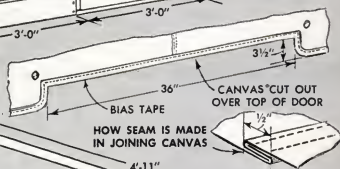
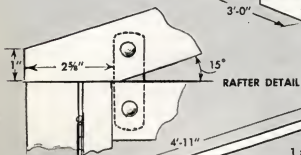
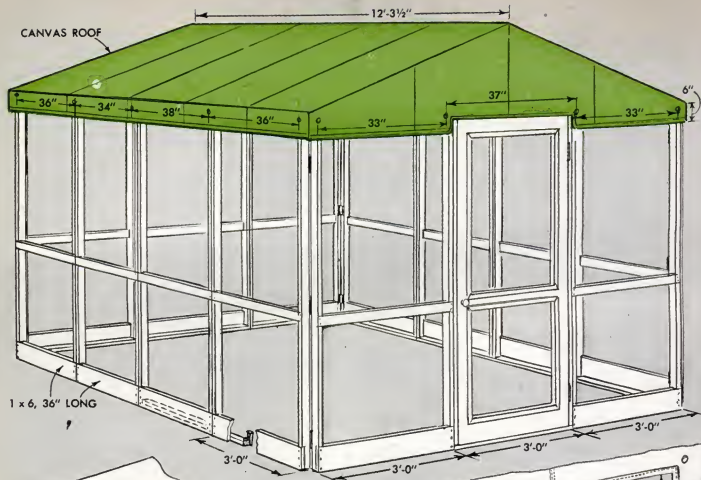
they will stand alone to aid in assembling the house.

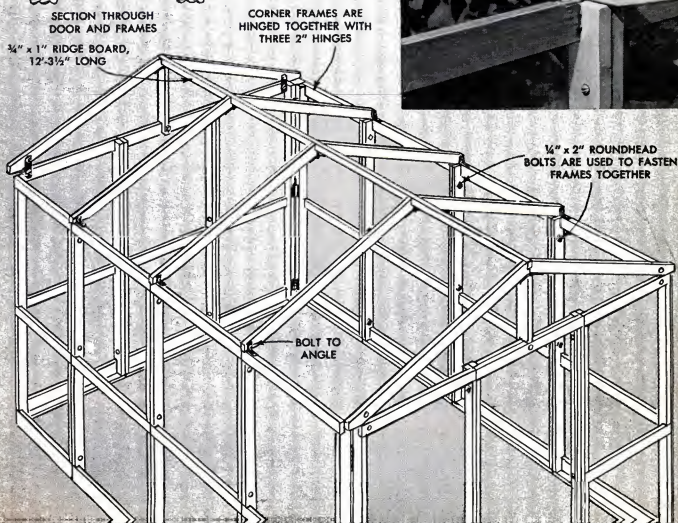
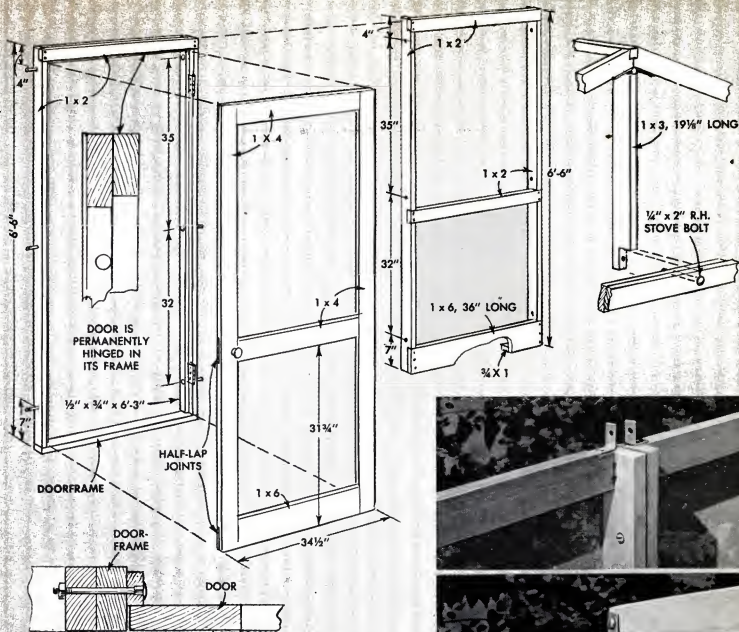
To begin construction, first cut 26 uprights 6½ ft. long from 1 x 2 stock. Next, cut 26 crosspieces 36 in. long from 1 x 2 stock and 13 crosspieces 36 in. long from 1 x 6 stock. Notch uprights as indicated and fit the three crosspieces so they are flush with the outer edges of the uprights. Assemble the frames with waterproof glue

Hinged corner sections of house stand alone while held in place by hooking grommets over screw eyes

other sections are bolted to them. Canvas roof is driven into upper crosspiece of each wall section









When assembling wall in which door is located, keep it as level as possible to assure doorframe does not twist out of shape. Photo at right shows how tape is stapled over hinged joint on corner sections of house

and coated nails. While any type screening can be used to cover the frames, glass-fiber screening, manufactured by the Lockset Screening Co., Inc., Canton, Mass., was used. This type screening is light in weight, requires no painting and does not stretch out of shape when objects are bumped against it. Staple the screening to the frames, then cover the edges with molding.

To permit "staking" the house to the ground, a fourth crosspiece, or anchor cleat, can be fitted in each section at the bottom, between the uprights and against the bottom crosspiece. Or, as an alternate method, $\frac{3}{4}$ x 1-in. strips can be added at the bottoms of the corner sections only. Two methods of staking the house are shown in details A and B on page 166.

The doorframe is made as detailed on page 167. Note that the two uprights, or jambs, are cut $\frac{3}{4}$ in. shorter than the other sections since the bottom member nailed to the ends makes the finished frame the same height as the other sections. Doorstops, consisting of $\frac{1}{2}$ x $\frac{3}{4}$ -in. strips, 6 ft.

3 in. long, are fitted inside each jamb. The door is hinged permanently in the frame.

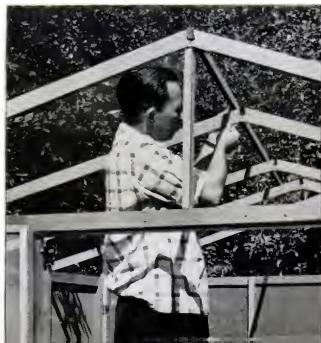
Use the frame to determine the dimensions of the door, which should have $\frac{1}{8}$ in. clearance all around. The stiles, upper and middle rails of the door are 1 x 4 stock and the lower rail is 1 x 6 stock.

The 1 x 2 roof rafters are cut as shown and hinged together in pairs. Cut the notches at the ridge ends carefully so they clamp the ridge board when the roof framing is assembled. As indicated on pages 166 and 167, the rafter ends are bolted between corner angles screwed to the top corners of each wall section. The end rafters are held by pieces of flat steel bolted to the corner sections as indicated. A 1 x 3 vertical support is fitted between the undersides of the end rafter peaks and the end walls.

It is suggested that the canvas roof be made by an awning shop, since most home sewing machines cannot sew canvas and hand sewing would be a tedious task. The house is assembled with $\frac{1}{4}$ x 2-in. round-headed stove bolts. ★ ★ ★

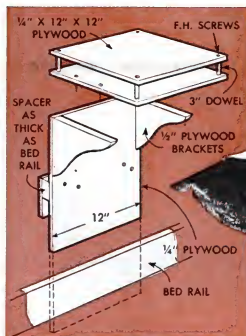
Hinged rafters are bolted to corner angles on wall sections. End rafters bolt to flats on end walls

Support for peak of canvas roof is provided by ridge board fitted in notches cut in peak ends of rafters



Simple Table for Sickroom Slides on Bedrails

Ideal for holding food, magazines, a lamp and other items for a bed patient, this table can be slipped on or off the bedrail in a moment, or it may be slid along the rail and located at any point from the head to the foot ends of the bed. Made of $\frac{1}{4}$ -in. plywood, the table has two "decks," the lower one for holding magazines. The bracket that holds the table is doubled at the bottom and fitted with a spacer so that it fits the bedrail snugly. Apply a durable, stain-proof material on the top of the table.



Foil Shields Corsage Pin

Common pins used for attaching flowers, ribbons or identity cards to clothing at social meetings can be shielded with metal foil to prevent loosening and also possible injury. A strip of foil is held on the back of the fabric so that the pin is pushed through it at two points. Then the ends of the foil are wrapped around the head and point of the pin, as shown in the illustration.



Painting Ship's Water Line

Greater success in painting water lines on ship models is possible if masking tape is applied above and adjacent to water line and the hull is painted carefully up to the tape after painting the bulk of the surface. First, lay the hull upside down on blocks and scribe the water line with a surface gauge. Then apply the masking tape along the line and burnish it down until the contact is absolute. Next, brush on the paint, being sure it has the proper consistency. Cover the surface away from the tape first, then paint up to the line with a rather dry brush. There will be less tendency for the paint to crawl up under the tape causing an indistinct line. Remove the tape after the paint is dry.

Paul Strayer, River Forest, Ill.

Soiled Book Edges Cleaned With Fine Sandpaper

When the edges of books become badly soiled, they can be cleaned by using fine sandpaper fitted around a curved sanding block (right). Use a block which has approximately the same curvature as the book edges. Sand lightly, using just enough pressure to remove the stained portion of the paper.—Ken Murray, Colon, Mich.



Stop Brass Tarnish

Brass items that need constant polishing can be protected against tarnish with a coat of clear metal lacquer. Be sure the surface is clean and free of polish before applying the lacquer. A second coat will give added protection.



Material excavated for the basement is used as fill to raise the lower level of this lot above the street



Above, the height of the box at its corners corresponds to the elevations at the corners of the lot. Below, surface of the sand should be shaped to approximate the contours and grades found on the lot



Do You Have a

WOULD YOU LIKE to see how your new house will look on a landscaped lot—before the house is built? You can, simply by making a scale model of the house and lot selected. There will be many practical uses for the model in addition to showing the best position for the house on a lot that is below the street level or on a hillside, perfectly flat or a series of gentle slopes. For example, the scale model will make it possible to determine in advance whether the excavation for a basement will provide enough fill for the landscaping. Also, it will be easier to find the most suitable location on the lot for the house, and to decide whether to raise or lower the floor line above the present grade. Sometimes moving it a few inches up or down will save moving tons of earth and yet obtain the most pleasing landscape.

The model of the house can be built of cardboard, using the over-all dimensions as provided in the plans, on a scale of $\frac{1}{4}$ in. to 1 ft. Fabricate complete walls and roof sections, glue the assembly together and decorate the exterior.

The first thing that is needed to reproduce the lot in miniature is a contour map of your lot. This must be drawn to the same scale as the model of the house. Show elevations at all corners of the lot as shown at the bottom of this page. With this information at hand, cut four sides and a bottom member from pieces of an orange crate and nail them together in the form of a box, such as the one shown on these



This house is set deep in the lot on a two-level terrace to accent its low profile and spaciousness

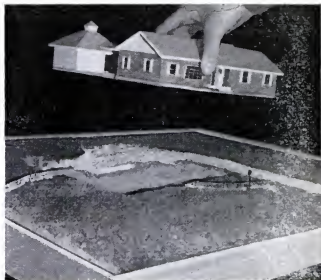
LANDSCAPE PROBLEM?

pages. Each side will represent a boundary line of your lot with the top edge sloped to conform to the elevation indicated on the contour map. Fill the box with damp sand and shape the surface of it to approximate the actual grades and contours.

The real fun begins when the model of the house is placed on the miniature lot and the old surface is reshaped into new grades and contours which will accent important features of the design of your house and give it individuality.

Using the scale model as a basis for estimating ground-fill requirements for landscaping, balance the amount of soil excavated for a basement, driveways, etc., against the amount of soil required for fill. This will enable you to design a landscape that will require an amount of fill exactly equal to the amount of earth excavated.

H. H. Connelly, Pickens, S. C.



Above, the real fun begins when you experiment with different locations for the house on the scale model. Below, after positioning the house, reshape the surface of the lot to approximate the desired contours





Stove Clock Fitted in Box Used as Darkroom Timer

The timer on the back panel of an old gas stove can be put to good use when it is fitted into a wooden cigar box and used as a darkroom timer, or in the office to make sure you do keep your promise to call back in ten minutes. Also, it can be used to keep the time down on long-distance telephone calls.

Tape Makes Waterproof Seal Between Sink and Cabinet

To prevent water from dripping down between a sink and the cabinet next to it, close the gap with a strip of waterproof adhesive tape. First, a narrow strip is applied over the joint to act as a support, followed by a wider strip on top. To secure tape ends, cut them to follow the contours of the sink edge and the cabinet corner at the juncture.



Tank-Type Vacuum Cleaner Defrosts Home Freezer

Home-freezer defrosting can be accomplished more rapidly, after food has been removed, by blowing warm air into the box with a tank-type vacuum cleaner. Plug the attachment hose into the blower end of the cleaner and direct the air at the edge between the side of the box and the accumulated frost, starting at the top and working down. Scrape the frost from the side and bottom with a plastic scraper, such as the ones used to clean car windows in cold weather.—John Stankiewicz, Nixon, N. J.

"Self Supporting" Paintbrush Keeps Paint off Surface



Drive a couple of small nails into the ferrule of your paintbrush as shown, and it can be laid on any surface without smearing it with paint. The nails serve as legs to support the bristles above the surface.

Block of Insulation Board Holds Fishhooks Safely

Snelled fishhooks can be stored safely in the tackle box if they are inserted in one end of a small piece of insulation board. The other end of the board is slit to take the leaders. In addition to being a safe storage method, the board makes selection of hooks easy and prevents them from becoming entangled with each other. Hooks to which leaders have not yet been attached can be pushed into the sides of the board. For convenience, fasten the board to the inside of the tackle-box lid.



the

POPULAR
MECHANICS

X187 WTM '57
CRAFTSMAN



TIME

TO BUILD A CLOCKCASE

Have you wanted a grandfather clock? They're a real luxury item if you buy one, but by making the case and installing a clock movement you can possess one at half the store cost

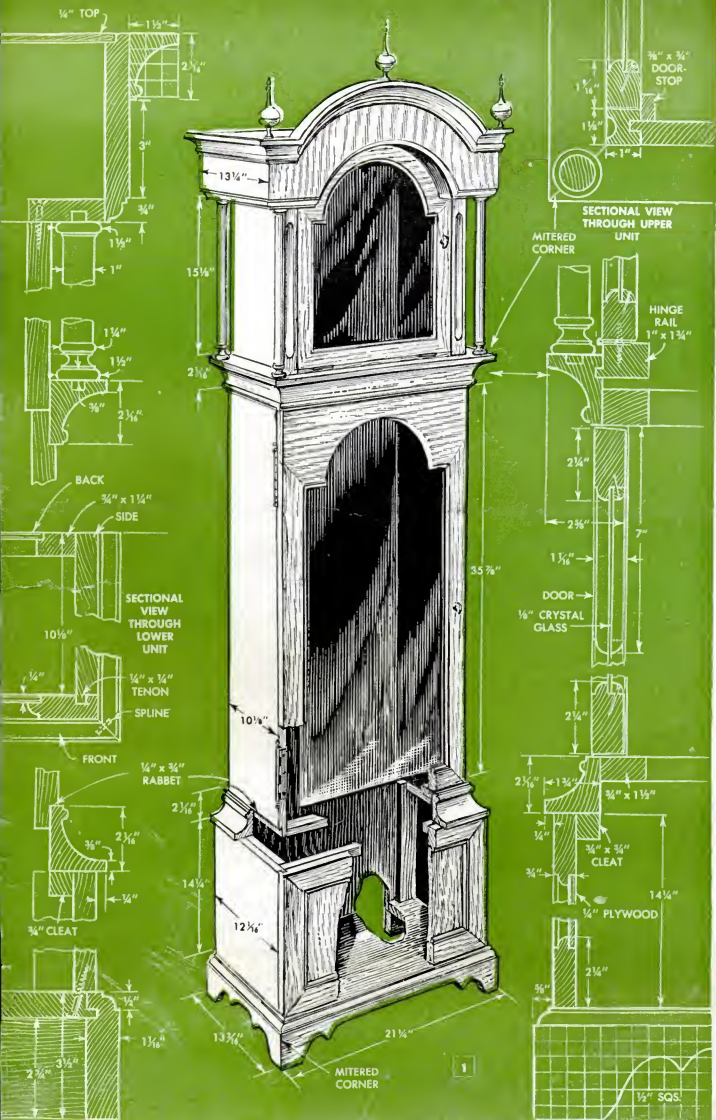
PART I

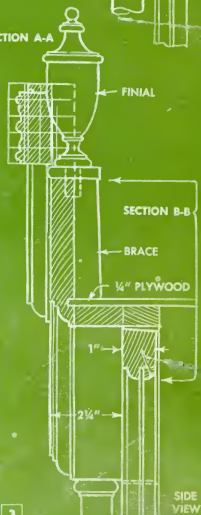
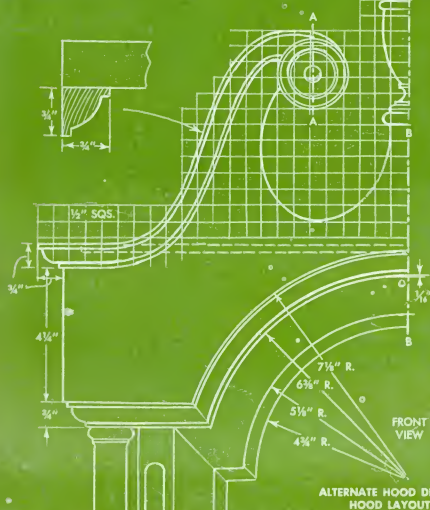
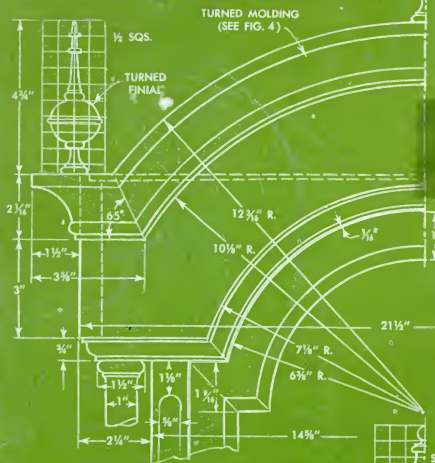
ALMOST EVERYONE has had the desire to own a beautiful grandfather clock. The charm and grace it radiates through the years reflect the character and personality of the proud owner. And pride of workmanship in building it yourself will give added enjoyment through the years. The movement in the case pictured at the right is a deluxe one, but less expensive movements are available. Cases in kit form to assemble and finish yourself also are available.

In this series of articles on clockcases you will be shown, in addition to the grandfather clock, how to build a grandmother clock, which is smaller in size, and two wall cases, one of modern design and the other traditional. Part I details the construction of the grandfather clock.



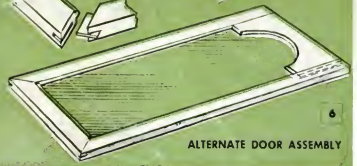
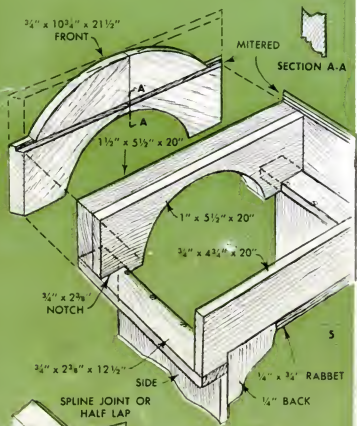
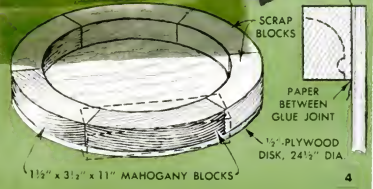
Designed by John Bergen







ATTACH DISK TO LATHE FACEPLATE



Beautiful Honduras mahogany is the wood to use in duplicating this elegant case. The case consists of three sections, namely, the base, waist and hood. After studying Fig. 1, begin making the base unit. As the bottom of the base is not exposed, it can be cut from less expensive wood, such as common fir plywood. This measures 12 3/4 x 19 7/8 in. and is rabbeted along three edges to form 1/4 x 3/8-in. tenons. The scrolled members which are added to the sides and front of the bottom board are grooved on the back to house the rabbeted edges, shaped along the top edges and then mitered and splined at the front corners. The grooves should be located so as to bring the scrolled members flush with the top of the plywood bottom. A plain board supports the bottom across the back.

Next step is to make the front panel. When completed, this should measure 14 1/4 in. high and 20 in. long so it will set in 5/8 in. at the sides. The frame itself is made of 3/4 x 2 1/4-in. mahogany and is shaped and rabbeted on one edge before mitering and assembling into a frame. A panel of 1/4-in. veneer-faced plywood, selected for quality of grain, is nailed and glued in the rabbet provided. The sides of the base measure 12 3/4 in. wide and 14 1/4 in. high. This allows for tenons which are formed along the front edges to engage grooves cut in the back of the front panel. After gluing the side panels to the front, the sides are sanded to make the joints perfectly even. Now the assembly can be glued and screwed to the top of the base-board, driving the screws up into the edges from underneath. Cleats, 3/4 in. sq., are added to the front and sides at the top, on the inside, to increase the thickness of the edges, after which rabbeted members are fitted at the rear corners to support the plywood back. Cove molding is now mitered, glued and screwed to the top of the base to support the waist section. You can have the molding shaped at a local millhouse or you can make it yourself by first beveling a sufficient length of square mahogany and then forming the cove on the beveled face. This is done by passing the work repeatedly across the saw blade at an angle and keeping it against a wooden fence clamped to the table. The blade should project only about 1/16 in. above the saw table to begin and should not be raised more than 1/16 in. after each pass of the work. The angle of the fence should be such as to produce a cove cut which approximates the shape of the molding shown. This is found by experiment. No attempt is made to form the bead as a part of the cove; this is a separate strip which is glued and bradded in place after sanding the cove smooth. Making cove molding with a circular saw was fully

Waist Section Comes Next

Yates-American Mfg. Co. photo

Hood Requires Most Work

Technical drawing illustrating the construction of a window frame assembly, showing the Hood Door and Lower Door components.

Labels and Dimensions:

- $\frac{1}{4}" \times \frac{3}{8}"$ RABBET
- $\frac{1}{4}" \times \frac{1}{4}"$ TENON
- $\frac{3}{4}" \times 2"$
- HOOD
- $\frac{3}{4}" \times 2"$
- $\frac{1}{4}" \times 1"$ RABBET
- MOLDING MITERED AT CORNER
- ROUTED
- HALF-LAPPED
- REAR SIDE
- MITERED HALF-LAP JOINT
- GLASS RABBET
- LOWER DOOR
- MITERED

The drawing shows the Hood Door (top) and Lower Door (bottom) components. The Hood Door features a hood and a rabbet joint. The Lower Door features a glass rabbet and a mitered half-lap joint. The assembly is shown in a perspective view, highlighting the mitered corners and the half-lapped joints.



deg. When this is done, the front piece is glued to the face of the built-up block and the center of all three is sawed on a $6\frac{3}{8}$ -in. radius. You'll notice in Fig. 2 that the front edge, including the curved portion, is shaped. This same cut is shaped along the side pieces of the hood. The back of the hood does not show and can be a piece of scrap wood, $\frac{3}{4} \times 4\frac{3}{4} \times 20$ in. A blind rabbet is cut in the lower edge of this member to receive the plywood back panel.

The back and front members of the hood are supported by $\frac{3}{4} \times 2\frac{3}{8} \times 12\frac{1}{2}$ -in. pieces which are screwed into the end grain of the side pieces of the hood. However, before these are permanently fastened, the four turned pillars which are mounted at the front and rear corners of the hood must be installed. Tenons are turned on the ends of the pillars to fit $\frac{3}{8}$ -in. holes bored in the cove molding at the top of the waist and the underside of the $2\frac{3}{8}$ -in. pieces. The pieces that cover the sides of the top assembly are mitered at the front ends, rabbeted along the upper edges and shaped along the lower edges to match the shaped edge across the front. The curved portion of the cove molding must be of the same section as the abutting molding so it



Here's what the upper part of the hood should look like when ready to install. Holes are yet to be made in the underside for the tenons on the pillars

matches perfectly where the two meet. The hood is completed by adding three turned finials. The details in Fig. 3 give an alternate hood design that is somewhat easier to make in that it does not involve the work of turning cove molding. Essentially, it is built up in the same way, a single finial being used at the center between two turned rosette overlays. In this design, the shaped molding that terminates in the rosettes is made by first shaping the edge of a wide board and then cutting off the edge $\frac{3}{4}$ in. wide to match the contour of the scroll top.

Doors Are Fitted Last

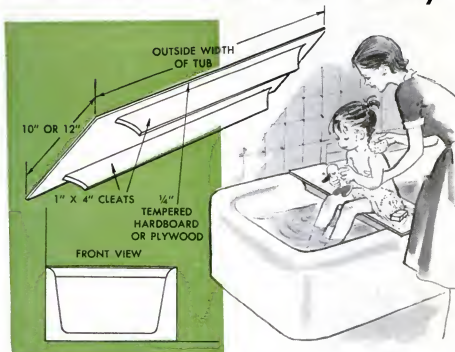
Fig. 8 shows how the hood and waist doors are assembled. Mitered half-lap corners are used in assembling the frames of both doors. The waist door differs in the manner in which the frame is formed at the top. Here, $\frac{3}{8}$ -in. plywood, with the grain running horizontally, is half-lapped into the frame after sawing out the curved section to provide a rabbet for the glass. The hood door, which fits between the sides, is hinged across the bottom and, therefore, the top of the frame must be beveled inward slightly for clearance. A strip is added to the right-hand side of the hood to provide a stop for the door. The waist door laps the edges of the waist section and is hinged along the side. Suitable clock hardware is available from suppliers of special hardware. The glass is held in the rabbeted edges of the doors with strips of quarter-round molding, tacking it in place on the inside.

Now, go over the completed case and sand it thoroughly, beginning with 2/0 paper and gradually changing to a finer grade. Always sand with the grain to avoid scratch marks. Slight dents in the wood can be raised level with surrounding wood by steaming. This is done by covering the dent with a damp cloth and applying heat with a household iron. Instructions for finishing the case will be given in Part II which will show how to build a grandmother clockcase, as well as two wall clocks.

(Continued next month)

Lightweight Bathtub Seat Doubles as "Vanity"

Consisting of a piece of $\frac{1}{4}$ -in. tempered hardboard screwed to two wooden cleats, this bathtub seat doubles as a bathtub "vanity." The hardboard fits directly on the tub and the curved ends of the cleats fit against the sides of the tub with only slight clearance. This arrangement prevents the seat from being dislodged accidentally from its right-angle relation to the tub sides. Finished in white or other color, the seat can be left on the tub when not in use, or can be conveniently stored in a closet.



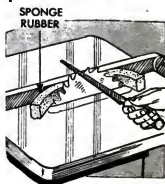
Tools Kept Within Easy Reach On Improvised Stringer



Tools and materials used for home repair jobs can be kept conveniently at hand when attached to the stringer shown. A spring-type clothespin is tied to each end of a shoelace, which is then fastened to your trouser belt. A roll of tape, screwdriver, hammer—with the handle inserted in the hole in the roll of tape—and other items can be slipped on the stringer or held by one of the clothespins, which can also be used as a spring clamp to hold wires together while making repairs.

Rubber Grips Table-Saw Blade When Touching-up With File

When touching up the blade of a table saw with a file, the blade need not be removed from the arbor if a strip of sponge rubber is used to hold the blade firmly in position. Raise the blade to its highest setting, place the rubber next to it and force the rip fence against the rubber. The fence will have to be released and locked only a few times, since about one fourth of the blade can be filed before it must be turned to expose a new section. When not in use the rubber strip can be attached to the file with a rubber band.



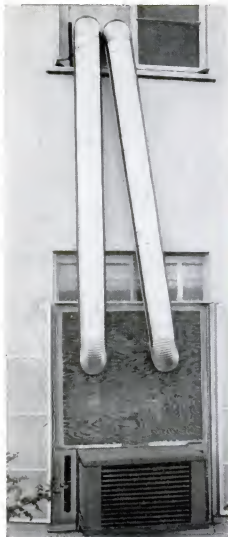
Small Holes Punched in Paper Bags Foil Noisemaking Urge

The urge of most children to blow up and "pop" empty popcorn bags can be defeated at get-togethers and church parties by punching holes in the sides of the bags in which popcorn and other refreshments are sold. A paper punch will do the job if only a few bags are used. If large quantities of bags are used they may be stacked and a drill run through them.

¶ If you want to know how much water a lawn is getting from a sprinkler, place an empty can within range and measure the water in it after a definite time interval.



Air Conditioner in Living Room Cools Upstairs Bedroom



This room air conditioner was converted by one homeowner so that it can be used to cool his living room during the day and at night the same unit can provide air conditioning for a second-floor bedroom. The only materials needed to make the conversion are several square feet of plywood and a few lengths of stovepipe. First, an enclosure with a lid on one side is made that will fit snugly over the cool-air vent at the top of the machine, which is mounted on a living-room window sill. Then, one of the bedroom windows directly over the air conditioner is removed, a piece of plywood fitted in its place, and the stovepipes are installed as shown.



One pipe permits cool air to pass from the enclosure to the bedroom when the lid is on the enclosure and the machine is turned on. The other pipe permits warm air to pass from the bedroom to the living room below, where it is drawn in by the air conditioner and recirculated. When the living room is in use, the lid is removed and both pipe openings are covered with flue stops so that the cool air is circulated only in that room.—Capt. Arthur P. Thiesen, USAF.

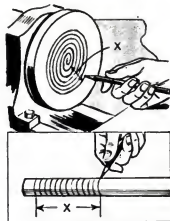
Legs for Modern Furniture Made From Spool Halves

Short legs with neatly flanged ends, ideal for use under small cabinets and chests of modern design, are made simply by sawing empty thread spools in half. Gluing is sufficient to hold the legs on lighter objects, while heavier furniture will require that the spool holes be countersunk or counter-bored to receive wood screws.



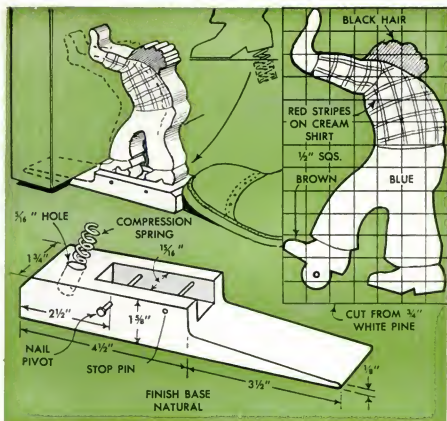
Determining Approximate Speed Of Slowly Rotating Object

If a speed indicator is not available, the approximate r.p.m. of a slowly rotating shaft or wheel can be determined by counting lines scribed on it. While the object is rotating run a pencil across its face or down its length just fast enough to produce individual lines. Count the number of seconds re-



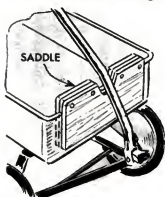
X IS NUMBER OF LINES
SCRIBED IN MEASURED
PART OF MINUTE

quired to mark across a specific distance, "X," and divide this number into 60. Multiply the resulting figure by the number of lines on the object and the product will be the approximate r.p.m. To increase accuracy, repeat the operation several times and take the average r.p.m. figure.



Dan the Doorstop Man is a colorful, animated worker you will enjoy having around the home. No matter how far the tapered base is shoved underneath the door, the little figure appears to be holding it open. A 3/16-in. compression spring under the heel of Dan's rear foot does the trick, forcing his hand against the door. An easy one-night project for the woodworking enthusiast.—Hi Sibley, Nuevo, Calif.

Positive Steering "Gear" For Coaster Wagon



Steering of a coaster wagon is made surer and safer on the hills if the handle is centered in a notched guide which fits over the front end as shown in the detail. It consists of two lengths of plywood screwed to a spacer of a

thickness that will permit the assembly to fit over the front endgate snugly. If the wagon bed is of the type having sides and ends with wide top flanges, screw a single piece of plywood to the inside of the front end and make a notch at the center for the handle to rest on.

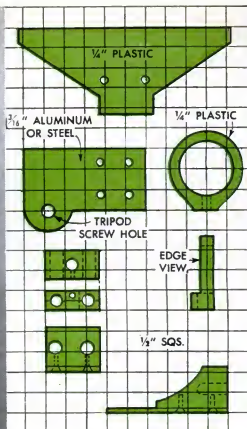
Wax Marproofs Furniture Casters

A coating of floor wax applied to the treads of furniture casters will prevent scratches or streaks on hardwood floors. For heavy furniture, rub the wax on half of each caster, move it an inch and coat the remainder.

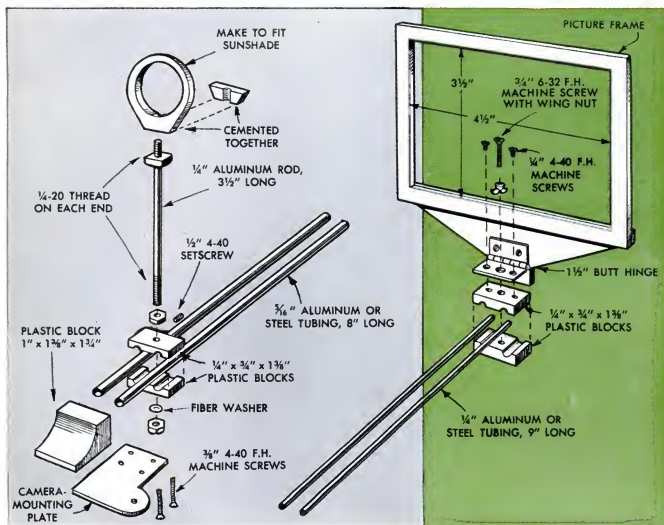
Date Stamp Cleaned in Solution Of Dilute Ammonia Water

When a rubber date stamp has had much use it becomes coated with dried ink, making it difficult to turn the rubber strips to new positions. The stamp can be cleaned very easily by disassembling it and soaking the parts in a solution of dilute ammonia water until the ink is softened and can be brushed off. To take apart, push the retaining pin from the frame member, and the rubber bands, rollers and impression bar will lift away.





Adjustable Sunshade for





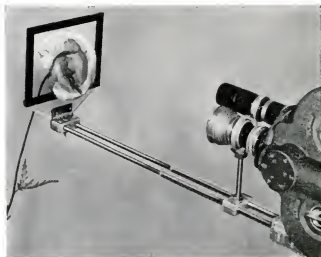
Above, picture-frame unit is mounted on slides that fit inside rails of sunshade unit. Frame centers subject and locates it at the correct focal point

Turret Camera

By M. G. Winterton

THERE IS NO NEED for separate filters and sunshades for a movie camera equipped with trilenses when this sliding-sun-shade unit is attached to the camera. Unit consists of two parallel tubes or "rails" which are cemented in a block of plastic shaped to fit against the camera. Different makes of cameras will require the block to be shaped differently, but it should be located on the camera-mounting plate shown, so that it can be held on the camera by means of the tripod screw. A plastic clamp that slides on the rails supports a standard and plastic ring in which the sunshade is held. Filters may then be used in the sunshade. Sliding the clamp along the rails permits the sunshade to be adjusted so it will fit against any of the lenses, regardless of the length of the lens barrel. An additional advantage of the unit is that when a telephoto lens is used, the sunshade and rails act as a support to steady it against vibration from the camera motor.

Auxiliary close-up lenses also can be held in the sunshade by screwing an extra filter-adaptor ring into it. The regular view finder on the camera cannot be used when close-up lenses are fitted over the regular lenses, so it is necessary to add an auxiliary framing device to the sunshade unit. This

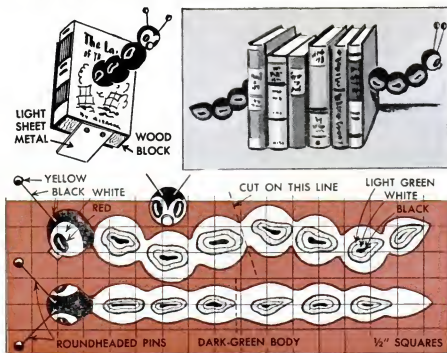


Use of frame permits holding subject fixed in relation to camera even though camera is unsteady

device consists of a wooden picture frame hinged to a plastic block in which are clamped a pair of parallel rods or tubes. These are designed to slide inside the rails of the sunshade unit. Subjects to be photographed then can be located the correct distance from any specific lens and centered in the picture as well.

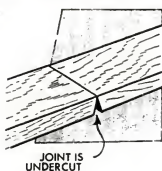
As indicated in the detail, either steel or aluminum tubing can be used for the rails of the sunshade unit and the slides of the picture-frame unit. Aluminum is preferable, because of its lighter weight. Plastic used on the units should be an acrylic or other type which will take a sharp thread.

'Bookworm' Bookends Offer Novel Book Display



For an unusual yet practical display of pocket-size books one homeowner carved a "bookworm" from a length of $\frac{3}{4}$ -in. lumber, painted it several colors as shown in the squared diagram, and fastened the "worm" on bookends made from book covers which were glued on squares of wood. After the covers are glued on, the "worm" is cut in half and one section is fastened on each book-end with a flatheaded screw. A piece of light sheet metal is fastened on the bottom of each book-end for support, as shown above.—A. M. Mortimer, Canton, Mass.

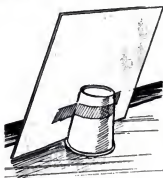
Bevel on Butted Trim Boards Assures Tight-Fitting Joints



Butt and miter joints in wooden doorframes can be made to fit tight by undercutting the joint as shown. In actual practice, very slight bevel is made on the joining members for a better fit.

Paper Cups and Tape Support Sales Cards

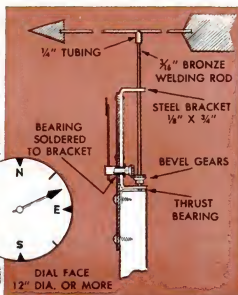
Paper cups are used by one sales clerk to hold small sales cards in an upright position on a showcase. The cups are taped to the backs of the cards flush with the bottom edge, as shown.



Weather Vane Indicates Wind Direction on Vertical Dial

There is no guesswork about which way the wind is blowing with this weather vane that indicates wind direction on a large

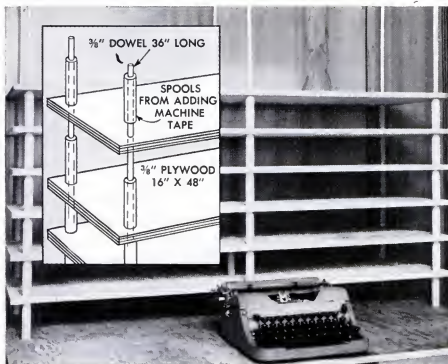
dial face. The dial is cut from hardboard or plywood and bolted to a U-shaped bracket bent from $\frac{1}{8}$ x $\frac{3}{4}$ -in. flat steel. A



shaft for the indicator needle rotates in a bushing soldered into a hole drilled in the bracket. The vertical shaft of the weather vane is a length of $\frac{3}{16}$ -in. bronze welding rod. It rotates in holes drilled through the short arms of the U-shaped bracket and rests on a thrust bearing under the bottom arm. Pieces of sheet metal and $\frac{1}{4}$ -in. tubing are used for the vane arrow. Bevel gears transmit wind direction from vane to dial.—James Whiteley, Olcott, N. Y.

Vacuum Fitting Cleans Camera

Cameras and other small devices are easy to clean with this vacuum-cleaner attachment. Cut a wooden disk, insert one end of a length of rubber tubing as shown, and secure it with glue. Various cleaning accessories, such as the brush and metal tubing shown, can be made for use with attachment.



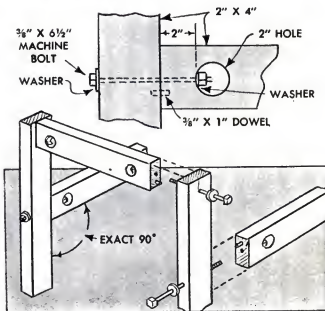
Knockdown Shelves

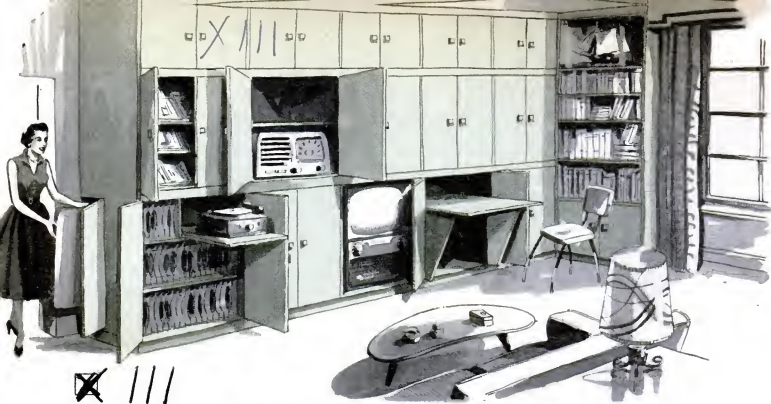
Spools from adding-machine tape are used as spacers for these plywood knockdown shelves that are held in position with dowels. After the shelves have been cut and drilled and the finish applied, they are assembled with the spool spacers on $\frac{3}{8}$ -in. dowels as shown in the detail. If you want a shelf with additional vertical space, to accommodate record albums and books in an upright position, slip two or three spools on each dowel before adding the next shelf.—F. Eliot Westlake, Cincinnati, Ohio.

Rigid Workbench Joint

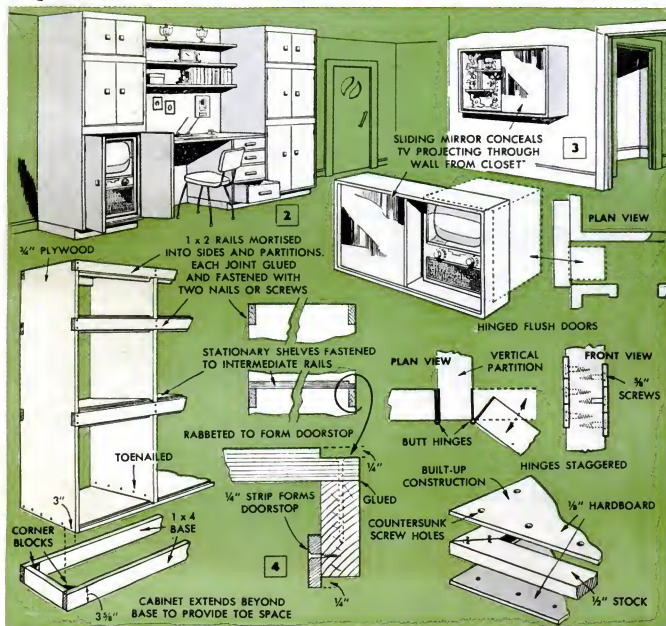
Extra rigidity and strength for workbenches and other assemblies can be obtained with the type of joint illustrated, if the joining parts are cut perfectly square. Other advantages are that the joint can be tightened to compensate for shrinkage of wood and can be disassembled and reassembled quickly. Holding power at the joint is provided by one bolt, while a short dowel or pin fitted in mating holes prevents rails from turning out of position.

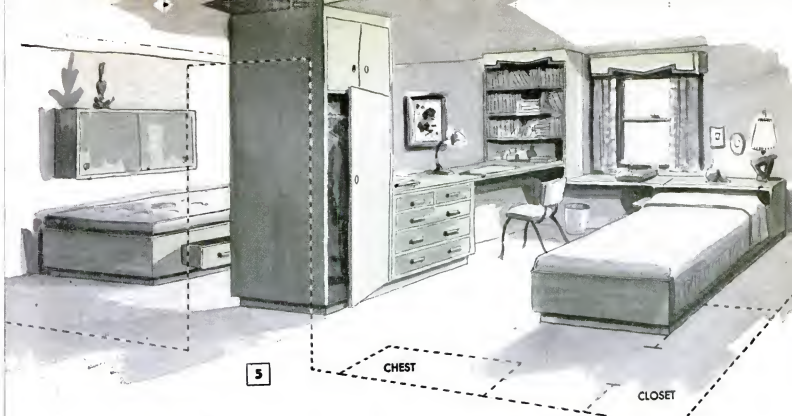
Keep a few candle stubs in a picnic basket to help start outdoor fires. A candle will keep reigniting a fire even when the paper and wood are slightly damp, and will be consumed itself when the fire is burning well.





MODERNIZE *Your Home*





with Practical BUILT-INS

by
Enno R. Haan

Ref.

Home Improvement Guide



WHEN MAXIMUM LIVING and storage space in a minimum of floor area are required, built-in furniture and storage units are the answer. The cost of the built-ins is less than that of individual pieces of furniture, and very often they can be used to conceal unsightly utilities or bulky appliances such as TV sets.

Living-Room Storage Wall

Running from floor to ceiling as in Fig. 1, a storage wall can be built against an existing wall or located so it acts as a partition between living and dining areas, or forms a vestibule at an entrance door. In the latter case a door is located on the entrance side of the partition, part of which then is used as a guest closet.

As illustrated in Fig. 1, card tables or folding chairs can be stored in a compartment behind the phonograph and record section. For convenience the phonograph may be mounted on a shelf fitted with roller-type drawer slides so that it can be pulled out for use. Inclined shelves provide a means of neatly filing your favorite periodicals. A radio installed in the wall is always available, yet may be hidden by closing two doors. Also concealed behind



Photo courtesy Wood Conversion Co.

Upper illustration shows how built-ins may be used to divide single, large bedroom for two occupants. Lower photo, built-in vanities are especially effective in adding practical beauty to a small bedroom

doors when not in use is a writing desk which consists of a sliding panel that rests on two hinged, triangular-shaped supports. If the storage wall is long enough it can also house a TV set, with or without its original cabinet.

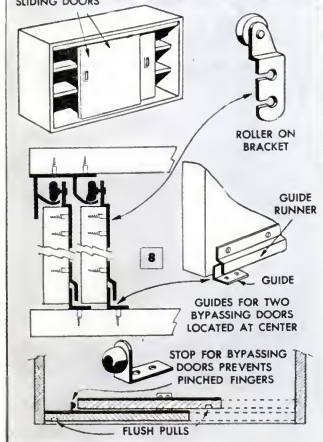
TV Storage Wall

A smaller, alternate storage wall that combines TV storage with bookshelves and



Photo courtesy Western Pine Assn.

SLIDING DOORS



Sliding-door hardware is easily installed, comes in various sizes to suit size of door. No floor space is required to open door fitted with this hardware

a desk is shown in Fig. 2. Fig. 3 shows still another method of housing a TV set. A whatnot shelf fitted with a sliding mirror or panel is attached to the wall so that the mirror can conceal the TV. The back of the TV set projects into a closet.

Details of the cabinets from which the storage walls are assembled are shown in Fig. 4. Bases of the cabinets are set back

Storage wall combined with vanity has closets with sliding doors, allowing built-ins on adjacent wall

3 in. to allow toe space. The cabinet bottom is nailed or screwed to the base, after which the sides and partitions are cut to size and mortised to take reinforcing rails. Permanent shelves are nailed or screwed to the rails. Cabinet sides are fastened in the same manner.

Stops for the lower edges of the doors are formed by rabbeting the front edges of the bottom shelves. Strips screwed to the inside lower edges of the rails form stops for the upper edges of the doors. Adjustable shelves should be set back 1 in. from the front edge of the cabinet. They are held by steel shelf supports that fit holes in the sides and partitions of the cabinet.

Hinged doors should come flush with the surface of the walls. Butt hinges used for the doors are set in gains as shown in the detail in Fig. 4. Hinges which are opposite each other on a partition should be staggered slightly so that screws driven in from opposite sides will not interfere with each other.

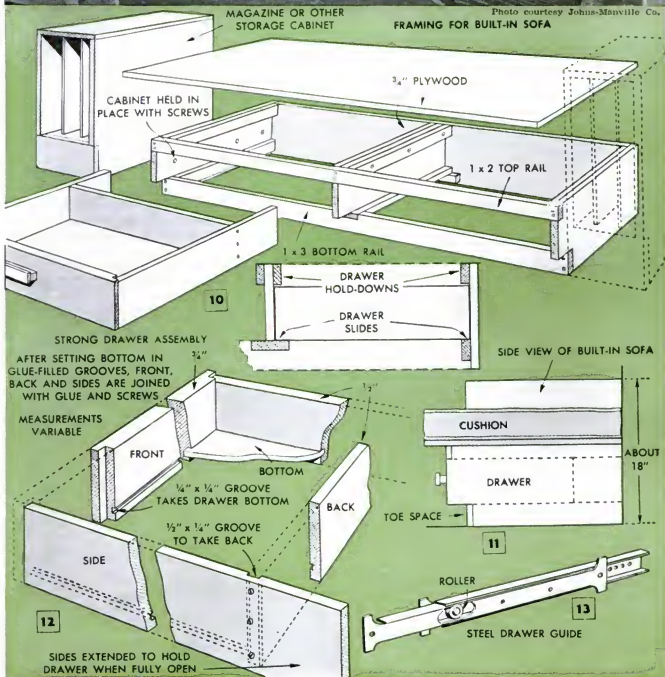
As indicated in the right-hand detail in Fig. 4, panels built up from $\frac{1}{2}$ -in. stock and sheets of hardboard can be used in constructing a storage wall in place of $\frac{3}{4}$ -in. plywood ordinarily used. Core pieces should be installed inside the panels at points where shelves are to be attached.

Bedroom Built-Ins

Real space savers are storage walls in a bedroom. Fig. 5 shows a large room divided by a semistorage wall consisting of cabinets and a double desk with tiers of drawers. The built-in bunks have spacious drawers underneath and cabinets for

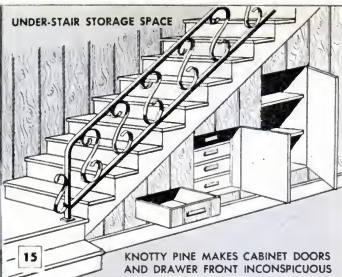


Photo courtesy John-Manville Co.





Douglas Fir Plywood Assn. photo



KNOTTY PINE MAKES CABINET DOORS AND DRAWER FRONT INCONSPICUOUS



Insulite Div., Minnesota and Ontario Paper Co. photo
Douglas Fir Plywood Assn. photo



17

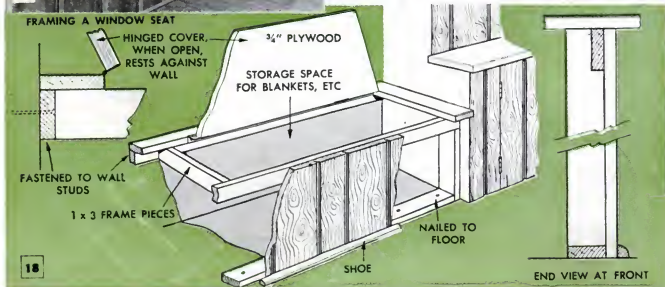
blanket storage at the heads. The latter cabinets are incorporated with shelves.

Built-in vanities such as shown in Fig. 6 are especially effective for improving bedrooms, particularly if they are backed with large mirrors and provided with recessed overhead lighting.

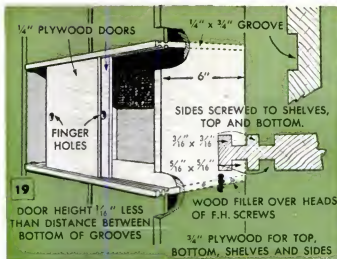
Often vanities are combined with small cabinets as shown in Fig. 7. Sliding doors for closets and cabinets, as detailed in Fig. 8, are easy to operate and do not require floor space as do hinged doors. Sliding-door hardware comes in sizes to fit small or large cabinet doors.

Built-In Sofas and Drawers

Walls that have recesses or setbacks, as in some attic apartments, are ideal for built-in sofas and drawers. The sofa base may contain two large storage drawers. Magazine cabinets, which also serve as end tables, can be provided at the sofa ends. Framework assembly of such a sofa is shown in Figs. 10 and 11. Depth of the drawers depends on whether a single cushion or a cushion and spring are used. Drawer construction is detailed in Fig. 12.



18



Narrow utility cabinets with sliding doors are practical in small bathroom where they require a minimum of space. Small doors do not require rollers, are simply set in grooves at tops and bottoms of cabinets

Roller drawer guides, Fig. 13, greatly reduce friction and make it possible to open and close drawers with very little effort.

Attic-Conversion Built-Ins

Space under the eaves that generally is not used in a finished attic is ideal for built-ins. The cabinet shown in Fig. 14 is an example. This unit contains a drop-leaf desk, a bookshelf and six storage compartments.

Almost any attic conversion can be planned to include clothes closets at the eaves. Small ones for children, Fig. 16, aid in teaching them to hang up their clothes.

Stairway Storage Space

Often overlooked as too small is the space under a stairway. However, by installing small cabinets and drawers as shown in Fig. 15 the space can be effectively utilized. To make such built-ins less noticeable, drawer fronts and cabinet doors should be covered with material that



Douglas Fir Plywood Assn. photo

matches and comes flush with the wall covering.

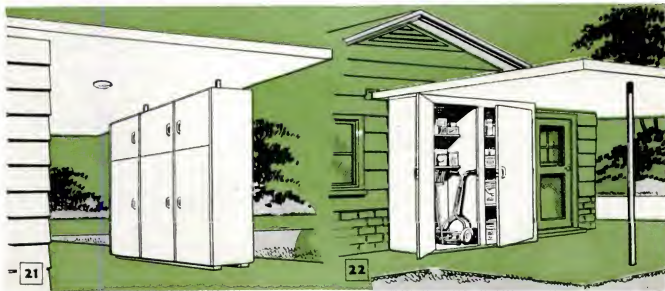
Storage Seats

Space under windows is a good place for storage seats. These may be combined with bookshelves or storage cabinets adjacent to the window as in Figs. 17 and 18. The seat cover should be hinged to a strip of wood extending a few inches from the wall so the opened cover rests against the wall.

Narrow utility cabinets, Figs. 19 and 20, are convenient in a bathroom. The small sliding doors fit in grooves.

Carport storage walls are handy for a house that has no basement or where a basement has no outside entrance. Fig. 21 shows a wall that acts as a windbreak. The wall in Fig. 22 is designed so a car cannot be parked so close to the house wall that the car door cannot be opened. ★ ★ ★

Carport storage walls are ideal for homes without basements, accommodate garden tools and bulky items

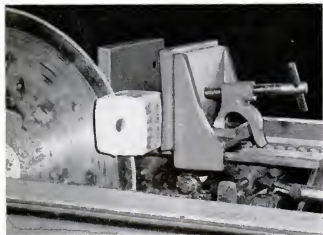


Mirror "Stitched" on Tent Wall Is Convenient for Shaving



Rough Gems Embedded in Plaster Easily Held While Cutting

One lapidary has found that gems are easier to hold for cutting when the stones are embedded in casting plaster. Cut a quart milk carton in half and fill the bottom half with pure plaster of paris mixed with water. When the plaster is about half set, push the stone to be cut into the center of the carton until it is nearly submerged. After the plaster has been allowed to harden for at least 24 hr., clamp the car-



ton in the stone vise and cut the stone into slices of the desired thickness. If you have many small stones to cut at the same time, they can be embedded in plaster in a half-gallon carton by following the same procedure, except that two or three layers of stones can be laid in the carton. Place a mark on the outside of the carton to indicate the position of each layer and cut from either end.

V. Lee Oertle, Azusa, Calif.

Supporting a shaving mirror at the correct height is no problem for one camper who fits a large auto rear-view mirror on a tent wall. Fishline is stitched through the canvas in a rectangular shape and the mirror is slipped into four oversize stitches at the corners. A metal-backed mirror is used because it is more resistant to damage than a regular shaving mirror.

Burrs Removed From New Keys To Protect Pockets

When new tumbler-lock keys are carried loose in the pocket they will soon cut through the fabric unless the burrs are removed from the machined edge of each key. This is easily done with fine emery cloth, a few strokes along the edge usually being sufficient. The amount of metal removed is so small that it does not affect the operation of the key in the lock.



Paint Renews Worn Linoleum

When the surface of linoleum becomes worn and unsightly, it can be painted in a solid color or in a new pattern. Apply a coat of floor enamel in the color desired. For a marble effect, tap on another color with a sponge, after the base coat has dried, or paint in a pattern to simulate stone masonry.—I. M. Fenn, Chicago.

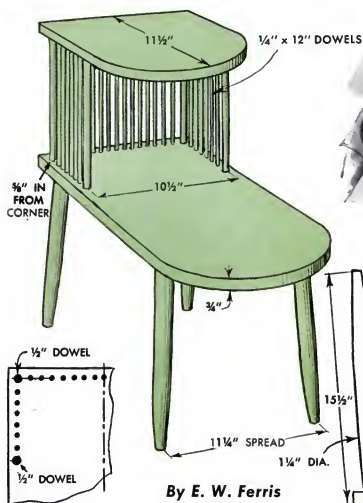
Yarn Sample Attached to Box Identifies Contents

When wool, cotton and other yarns in various colors and grades are stored in individual boxes the contents of each can be identified at a glance if a sample is taped to the front of the box. Yarns that are removed for mending or other purposes are returned to the appropriate box each time, which prevents mixing them.

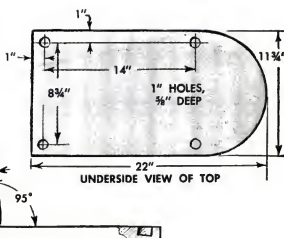
Mrs. M. Fey, New York City.



Step Table



By E. W. Ferris



THIS STEP TABLE provides a real challenge to the craftsman who enjoys doing accurate work with a drill press. Construction of the table requires drilling 66 blind holes $\frac{5}{8}$ in. deep.

First, cut the table top and step to size and shape from $\frac{3}{4}$ -in. plywood or solid stock. The step measures $11\frac{1}{4}$ in. wide and $11\frac{1}{2}$ in. long, while the top is $11\frac{1}{2}$ in. wide and 22 in. long. All dowels between top and step are fitted in holes centered $\frac{5}{8}$ in. from the back and side edges of both top and step. Center spacing between the $\frac{1}{4}$ -in. dowels is $\frac{5}{8}$ in. on center. It is best to use a paper pattern to make certain the holes in step and top align. Each of the

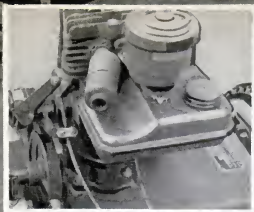
dowels is 12 in. long, resulting in a spacing between top and step of $10\frac{1}{4}$ in. Taper the ends of the dowels slightly to facilitate assembly.

Legs for the table are made from four $1\frac{1}{4}$ -in. dowels $15\frac{1}{2}$ in. long, with a taper turned on the lower portion of each. The upper ends of the legs are turned down to fit 1-in. holes drilled in the underside of the table top. The latter four holes are drilled at a 95-deg. angle by clamping the table top to the drill press and shimming the top to a 5-deg. angle. Use a Forster bit which permits drilling a square-end hole so the legs will fit deeper. Use only glue in assembling the table.

Straightedge Is "Skidproofed" to Minimize Glass Breakage



Possible spoilage of glass caused by having a straightedge slip while cutting it can be minimized by providing the straightedge with a slip-resistant surface. If the straightedge is made of unfinished wood, apply a coating of rubber cement to provide skidproofing. If the straightedge is made of finished wood or metal, apply friction or rubber tape as shown.



Kills Rodents

An old vacuum-cleaner hose attached to the engine's muffler can conduct deadly fumes to rodent's burrow

Use the Engine on Your Power Mower for Other Jobs

SN58

By Tom Riley

THE ENGINE on your power lawn mower probably will deteriorate as much from lack of use as from wear, so why not put it to extra work turning a concrete mixer, sawing wood, running a paint sprayer and other jobs before the day of trading the mower in on a new model? Most reel-type mowers can be adapted for use with the accessories illustrated in this article. To mount some of the accessories and also to use the mower as a light hand truck, it is necessary to provide a simple platform such as the one shown in the detail on page 196.

Engine Exhaust Kills Rodents

One of the simplest attachments for your mower is one that can be used to exterminate burrowing rodents. If an old vacuum-cleaner hose is available, cut several 2-in. slits in one end of its metal fitting so that the latter can be slipped over the exhaust pipe. Connect the hose to the end of the tube, place its other end in the entrance to a rodent's burrow and idle the engine for three to five minutes.

Mower Headlight

A headlight is another handy accessory

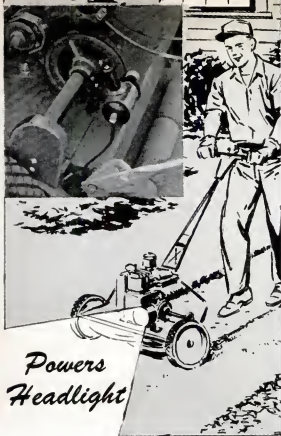
to have on a mower for anyone who must cut his lawn after dark. For the necessary current to operate the light, mount a bicycle generator on the engine platform so that its drive wheel will bear against the mower's V-belt. The generator can be attached permanently by providing a two-position bracket that allows the generator to be pushed away from the belt when the light is not in use.

Operates Paint Sprayer

A small air compressor of the diaphragm type can be attached to your mower for those occasional painting jobs or for applying certain types of insecticides. In addition to saving the cost of an electric motor, this installation will permit you to use a spray gun away from an electrical outlet. When a considerable volume of air is required, an air tank can be attached to the air hose between the compressor and the gun to supply the needed reserve.

Drainage and Fire Pump

For a handy portable pump that can be used to drain a flooded basement, for irrigation, and many farm uses, mount a low-pressure big-volume centrifugal pump



Powers Headlight

Friction-driven by V-belt, bicycle generator provides current for headlight

on the platform. A V-belt drive can be used, with the pump pulley about the same size as the one on the engine to give proper operating speeds. The pump can be removed when not in use.

If you would like to have some emergency fire protection handy, mount a small, high-pressure centrifugal pump on the mower so that a V-belt can be slipped on its pulley at a moment's notice. Garden-hose couplings should be fastened to the outlet and intake on the pump to permit quick connection of your garden hose in the event of a fire.

Operates Generator

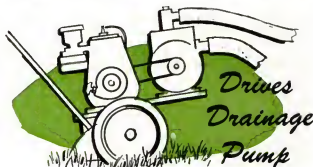
A variety of power equipment can be operated when a 110-volt a.c. generator is attached to your mower. This accessory will permit you to use electric hedge clippers, sprayer, small power tools, etc., where no electrical outlet is available. A 600-watt generator is the maximum size that should be used with the average small lawn-mower engine.

For recharging auto batteries it is only necessary to replace the 110-volt generator with a used auto generator. The latter



Sprays Paint

Paint-sprayer compressor mounted on engine platform supplies spray gun with sufficient pressure, saves cost of an electric motor



Drives Drainage Pump

Attach drainage pump to a demountable, plywood platform for a handy unit that is easy to move to window of flooded basement



Operates Fire Pump

Small, high-pressure centrifugal pump with garden-hose fittings is mounted on engine platform for emergency fire-protection use

A 110-volt a.c. generator driven by mower engine provides portable supply of electricity for small power tools used outdoors

Trims Hedge

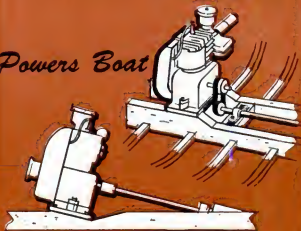




Charges Car Battery

Used automobile generator powered by
mower engine recharges car battery

Powers Boat



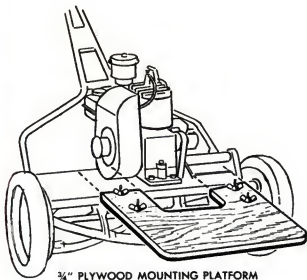
Detached engine powers boat. Mount it as
shown above for direct or indirect drive

Drives Cultivator



Above, engine can be used to drive garden
cultivator or operate concrete mixer below

Operates Concrete Mixer



$\frac{3}{4}$ " PLYWOOD MOUNTING PLATFORM

Attach a piece of plywood to engine platform and
you have a practical hand truck for light loads

can also be used to provide current for
lighting away from an electrical source by
rigging several auto headlights on extension
cords.

Detached Uses

Most reel-type mower engines can be
removed from their platforms in a few
minutes and used to power other equip-
ment while the mower is not in use. Mount-
ed on engine stringers in the stern of a
rowboat or sailboat and fitted with a shaft,
shaft box and propeller, the engine can
provide ample auxiliary power. If you are
a mechanic at heart and wish to build your
own garden cultivator, the mower engine
is a natural for powering it. A suburban
dweller or farmer with a wood lot can put
the engine to work powering a dragsaw or
circle saw.

Many home-size concrete mixers are
available without motors. Your mower en-
gine will easily handle a $3\frac{1}{2}$ -cu.-ft.-capacity
mixer, when it is mounted on a plywood
platform on the mixer frame.

A sickle bar and a power edger are avail-
able for some reel-type mowers. Power for
the sickle bar is transmitted by means of
an eccentric wheel bolted to one end of the
mower reel.

★ ★ ★

Mounted on a special wooden platform a mower en-
gine can be used to power a small cordwood saw

Saws Wood (See Oct 47, 211)



Panels in Door Replaced With Glass to Lighten Dark Entryway

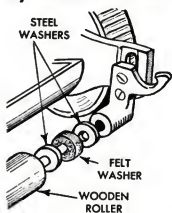
Very often there is an area in a home, such as a basement entryway, that is dark even during daylight hours because a wood-paneled door keeps out the light. The solution to this problem is to replace one or two of the wooden panels with glass. This can be done easily and without removing the door from its hinges. The panels are held between the molded edges of the stiles and rails of the door. To remove the panels, use a fairly wide wood chisel and cut off the shaped edges as shown in the upper left-hand photo. Drive the chisel gently into the wood and pry carefully so the molded edge splits away from the stile or rail. Since the wood used in doors is fairly straight grained, it is possible to split off the molded edge along a reasonably straight line. Next, trim off any excess wood from the rabbet formed by removing the molded edge, as in the upper right-hand photo. Before installing the glass in the opening, apply a layer of putty about $\frac{1}{16}$ in. thick to both edges of the rabbet. Fit the glass in



place and secure it with glazier's points. To provide a finished appearance on the inside of the door, nail strips of quarter-round or stock molding that is similar to the molded edges removed around the edges of the glass.

John Dalen, Morton Grove, Ill.

Lawn-Mower Roller Lubricated By Saturated Felt Disks



Oil-soaked felt disks installed between steel washers on the axle pins of a lawn-mower roller will keep the roller well lubricated. It may be necessary to cut down the length of the roller slightly in order to accommodate the arrangement. This

will not only eliminate squeaking but also will protect the pins against rust and excessive wear.

☐ A cedar closet or chest is kept fragrant and mothproof if the inside is sanded lightly once a year. Sanding reopens the pores, releasing the natural oil in the wood, which repels moths.

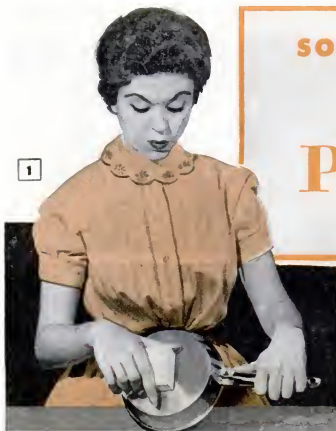
Coat-Hanger "Clamps" Hold Cover on Car Seat

Protective cloths thrown over the back of a car seat to protect the upholstery while work is being done on the inside of a car often slip down and expose the upholstery to soiling. To prevent this, bend large "clamps" from coat hangers as indicated. When slipped over the top edge of the seat back they will hold the cloth in place and will not damage the upholstery.



SOLVING

Home Problems



1. ORDINARY SOAP applied in a thin film to the bottom of pans and skillets before use will prevent formation of that sticky, sooty coating that takes so much scouring and polishing to remove. Warm the pan slightly and rub the bottom with a bar of soap as pictured. This coats metal with thin protective film

2. SMALL JARS OR TUMBLERS containing cheese, left-overs and baby foods won't tip when placed on refrigerator shelves if you take the precaution of setting each one in an inverted plastic jar lid. The jar lid takes up little more space than the container and does not interfere with air circulation

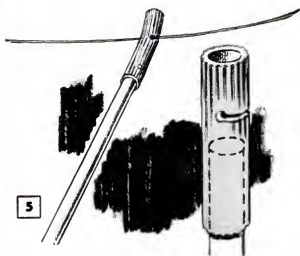
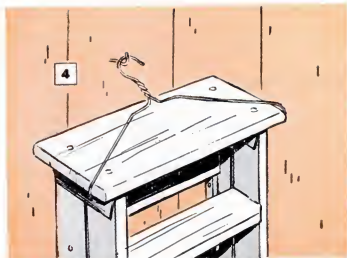


3. STRIP OF SANDPAPER taped to a thimble speeds up the slow, tedious job of plucking basting threads from fabrics having a standing pile or nubby weave. Sandpaper strip should be cut about $\frac{1}{4}$ in. wide and long enough to be taped to the thimble as shown, with sand side out. Draw strip tightly around end of thimble before taping so that it will stay in place while lifting the threads

4. A COAT HANGER will support your stepladder flush against the wall of the garage or utility room so that it takes up the least possible space when not in use. Set the ladder flush against the wall, measure and drive an L-hook so that it centers about 3 in. above the top step of ladder to catch the hanger hook. Then place the ladder against wall and drop the hanger over the top step in the manner pictured

5. CLOTHESLINE PROP won't slide sideways or fall from the line on the windiest spring day if you take time to slot a length of garden hose and slip it over the end of the pole with the slot gripping the line as pictured. Before slotting it's a good idea to drill a hole through the hose the size of the line, then cut the slot down to it. Bend the hose slightly to open the slot so it can be slipped over the line





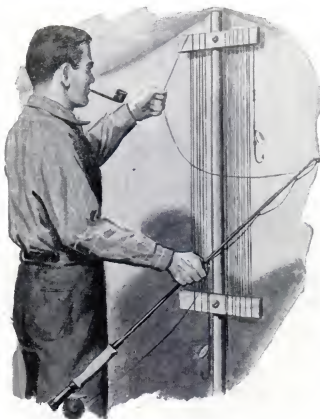
6. STRIPS OF LUMINOUS TAPE effectively warn against collisions with open doors in dark hallways, or anywhere in the home where it is necessary to leave a door slightly ajar at night. You can attach a short strip slightly below eye level as pictured, or place several short strips diagonally across the edge of the door at the same height



7. BUTTONS that have been sorted can be kept in order without mix-ups or loss if they are threaded onto a pipe cleaner. The brush-like fibers on the cleaner hold buttons securely in place and flexibility of wire permits bending into a loop and twisting ends for safekeeping. Selection of buttons of different sizes also can be kept in order

8. SALT SOLUTION left in a saucepan overnight will soften the hard residue that remains in the bottom of the pan when preserves and other foods are inadvertently permitted to boil dry. When this happens, fill the pan about two thirds full of cold water. Add a heaping teaspoonful of salt and stir into solution. Let stand overnight





Turn Buttons on Tent Pole Hold Fishline for Quick Drying

Two wooden turn buttons, screwed firmly to one of the poles of your tent, will serve as a drying reel for your fishlines. The buttons are turned vertically, in line with the pole, when not in use or when folding the tent.

Wooden Plaster Trowel



A trowel that is adequate for occasional cement or plaster work, can be made by screwing a drawer pull to a short length of smooth wood as shown. Although this improvised trowel will not produce as smooth a finish as would

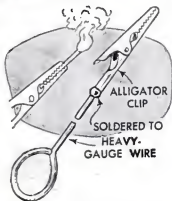
be possible with a metal one, it is quite satisfactory for many jobs.

Got a Green Thumb?

You can get the jump on early spring planting by starting your transplants in a greenhouse of your own. A feature in the May issue shows how to build three types, all designed around the use of storm-window sash. One is a separate structure, another a lean-to that may be attached to garage or house and a third a window type that is accessible from the basement

Match Holder to Light Gas Pilot Made From Alligator Clip

Heavy-gauge wire with a small alligator clip soldered to one end will provide a good match holder for lighting pilots in gas furnaces, incinerators and hot-water heaters, and with less fire hazard than using rolled paper or a stick of wood. The tool holds the match in line with the handle for easy insertion through the small opening provided in the units for lighting the pilot.



A. J. Repace, Canton, Ohio.

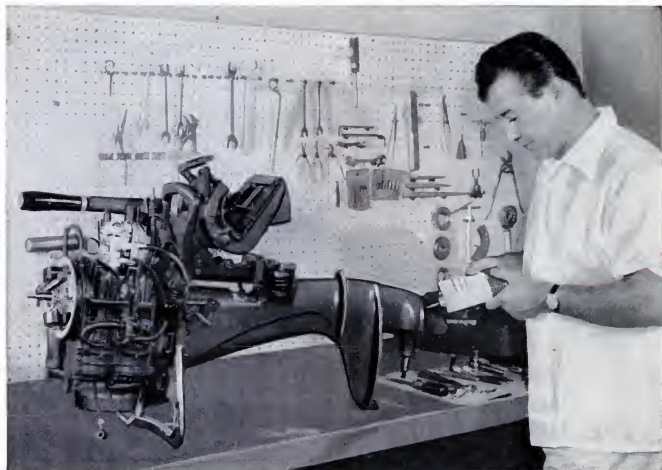
Paraffin Lubricates Screws

Paraffin is a better lubricant for wood screws than soap because it not only helps in driving them into wood, but also prevents steel screws from rusting. Keep paraffin handy and use it for nails too.

Paint Can Has Job-Data Label

Before storing partially used cans of paint, glue a slip of paper to each lid and write on it the date and the article on which the paint was used. When some object requires a touch-up paint job later, it is necessary only to check the data on the lids to find the correct paint. Also, the date will aid in judging the wearing qualities of the paint. Remember always to store the cans upside down.





Photos by Scott-Atwater Mfg. Co.

Regular Maintenance Checkups KEEP YOUR OUTBOARD HUMMING

DON'T WAIT until it's time to get buzzing before giving your outboard motor those basic checks that keep it running smoothly throughout a long boating season. Just as it is with your car, it's careful attention to small maintenance details that keeps an outboard operating reliably and with a minimum of wear. You can carry out most of the maintenance checks and adjustments yourself with only a few tools. Major overhaul and repair should be left to your dealer's service department.

Mount the motor on a stand as in photo at the right, or on a block of wood clamped securely in a vise. Remove the motor housing to expose plugs, wiring, throttle linkage and flywheel.

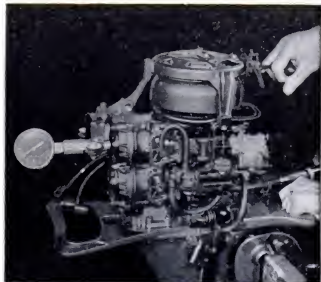
The photo above serves to emphasize the importance of one step in lubrication procedure it is essential not to overlook. This step is to remove the vent plug above the filler plug which is located at the bottom of the lower unit. If oil is needed remove the filler plug and add the required amount, using only outboard lower-unit oil as recommended by the manufacturer in the owner's manual. Then carry out the steps pictured on the following pages. ★ ★ ★





Usually a light tap with a soft hammer will loosen flywheel on tapered shaft so it is easily removed. Use care in this step, or you may damage bearings.

Remove spark plugs and check electrode gap with gauge. If necessary, reset to the correct gap. Scrape away all carbon accumulation. Do not sandblast.



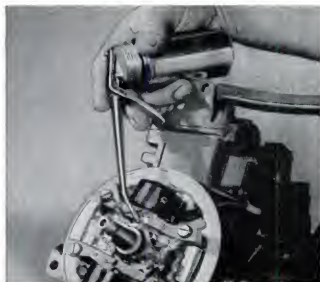
Take compression-gauge readings to detect scored cylinder walls or defective rings. To obtain correct reading, pull starter cord at least three times.



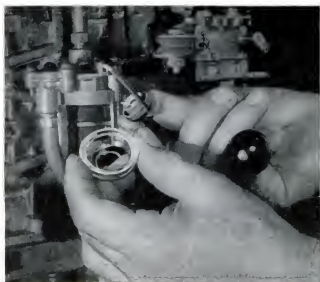
Remove starter housing and check pawls. In photo inset, note that starter cord is held tightly in left hand to keep starter pawls raised for lubricating.

Check magneto points with gauge recommended. If necessary, reset to proper clearance. Clean parts. Place drop of oil on shaft when replacing flywheel.

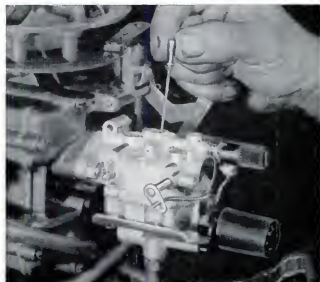




In some cases it is necessary to reoil the felt cam wiper. Use only a few drops of No. 10 oil. Be careful not to drop oil on any other part of the mechanism



If motor has fuel pump, clean the sediment bowl and check the fuel-pump line to detect any leakage. Also clean the diaphragm seat before replacing the bowl



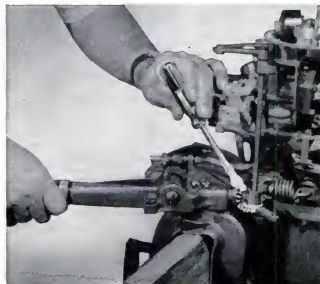
Unscrew the idle jet and blow through it lightly to clear. Motor will not idle smoothly if jet is clogged. Don't use compressed air without disassembling



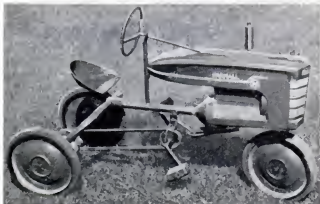
Go over linkage control, checking especially for loss of locking keys. Missing keys should be replaced immediately, also keys which show any looseness

Use a water-repellent grease of approved type on bevel gears of linkage. Apply enough to coat gear teeth. Check nuts, screws and pins for tightness

Remove propeller and check condition of shear pin. Replace a bent or worn pin. If prop is of the type having shock-absorber cushion, check for undue wear



Pedal-Driven Miniature Tractor Has V-Belt "Transmission"

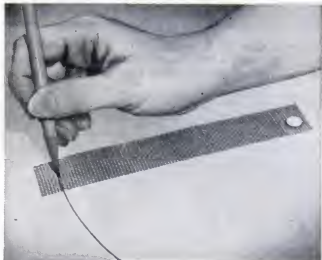


Dad's ingenuity and a welding machine, plus some $\frac{3}{4}$ -in. pipe and sheet metal resulted in this realistic-looking miniature tractor for a junior farmer. One of the rear wheels is pinned solidly to the axle, while the other turns freely to provide a "differential" action. Speed changes in the belt drive are possible with a "transmission" consisting of a 3-step V-belt pulley on the rear axle. The pedal crank is suspended in a pivoted fork. A bevel gear on the steering column meshes with another on the front-wheel spindle.

Screen Strip Used as Compass

A strip of screen wire secured at one end with a thumbtack makes a handy improvised compass. The mesh allows a pencil point to be inserted at any desired opening in the strip. Since the openings are greater in size than the diameter of the thumbtack, you should bear outward as you scribe the circle to keep the wire against the shank of the tack. The compass also can be used to scribe circles too large for an ordinary instrument.

☐ Aluminum-foil pans in which frozen pies are purchased can be used as "saucers" for flowerpots.



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Shop Notes



Build Your Own BELT SANDER

By David W. Murphy

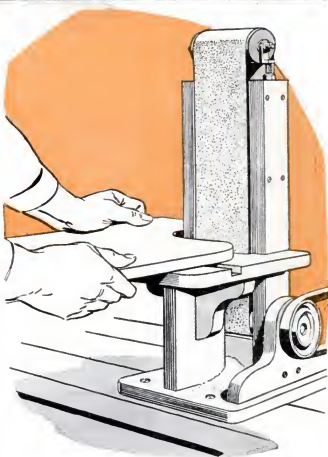
DESIGNED FOR THE MAN who likes to build his own power tools, this belt sander uses a standard 4 x 36-in. belt and has ample capacity for handling most metal or wood jobs in the average workshop. An added feature of the sander is a crosscut guide fitted into a groove cut in the table. The guide, which is borrowed from a table saw, takes the guesswork out of maintaining the correct angle on miters and square cuts being sanded. Also included in the design of the sander are adjustments to permit maintaining correct belt tension and for centering the rotating belt on the drums. Loosening the same two adjustments allows quick removal and replacement of the belt. Power is supplied by a ¼-hp., or larger, electric motor.

Sander Frame

Begin construction of the sander by first cutting all the frame parts from ¾-in. plywood as detailed on page 206. Only one of each of the frame parts is required except for the table-support brackets and the ¾ x ¾ x 4½-in. spacer blocks that are fitted between the belt backup pieces. Make two of each of these. When laying out the 10 x 12-in. base of the sander, locate a hole in each corner so that it can be bolted or screwed to a workbench or table top.

The 1½-in. holes in the lower bearing housing and the left-hand drum support should be drilled slightly undersize to provide a press fit for the ⅞-in.-i.d., 1½-in.-o.d. flanged ball bearings in which the shaft of the lower drum rotates. Notch the upper end of each of the drum supports ¾ in. wide x ¼ in. deep to accommodate the upper-drum support plate, which is a piece of flat steel, ¼ x ¾ x 6½ in. Note that the upper spacer block is located ¼ in. below the upper ends of the backup pieces so it aligns with the notches in the supports.

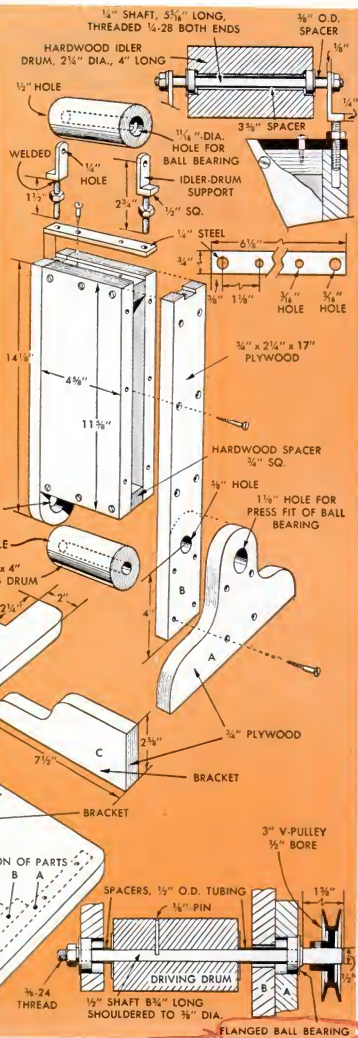
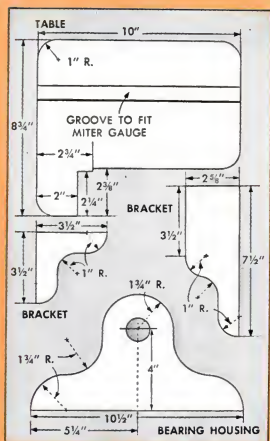
Assemble the backup pieces on the spacer blocks and screw on both vertical supports. When attaching the bearing housing A to drum support B, make sure the bearing



hole in the housing aligns with the bearing hole in the left-hand drum support. The drum-support assembly now can be screwed to the sander base. The detail of the base on page 206 indicates the relative positions of bearing housing A, drum support B and bracket C. Screw the table-support brackets to the table support and attach the table. The assembly now can be screwed to the sander base. Check to make sure the slot for the crosscut guide is parallel to the backup piece.

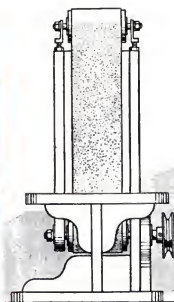
Drum Construction

If a lathe is available, the drums for the sander can be turned from solid stock. An alternate method, when no lathe is available, is to fabricate the drums from plywood disks. Cut the disks about 2½ in. in diameter with a circle cutter and drill a ¼-in. hole in the center of each one. Coat the disks with glue, stack them 4 in. high and clamp them together by using a long ¼-in. bolt and nut. Use a washer under the bolt head and nut. The bolt should project enough so that it can be chucked in a drill press. When the glue has dried, each of the two drums then can be filed and sanded to size while rotated in a drill press. Bore out the hole in the lower, or driving, drum

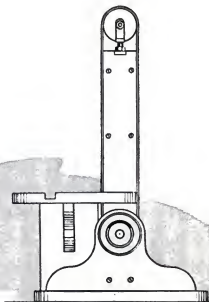




To install belt, lower upper-drum supports. Raising or lowering one of the supports centers rotating belt on drums



FRONT VIEW



SIDE VIEW

to $\frac{3}{8}$ in., and the hole in the upper, or idler, drum to $\frac{1}{2}$ in.

Driving-Drum Assembly

The shaft for the driving drum is a length of $\frac{1}{2}$ -in. rod $8\frac{3}{4}$ in. long. It is shouldered to $\frac{3}{8}$ in. in diameter, leaving $1\frac{3}{8}$ in. at the original diameter to accommodate a 3-in. V-belt pulley that has a $\frac{1}{2}$ -in. arbor hole. An alternate method for making this shaft is to use a $\frac{3}{8}$ -in. rod and fit one end with a $1\frac{3}{8}$ -in. length of tubing having a $\frac{3}{8}$ -in. i.d. and a $\frac{1}{2}$ -in. o.d. to accommodate the pulley. A hole is drilled through the tubing so the setscrew in the pulley will contact the shaft. One end of the shaft is threaded $\frac{3}{8}$ -24 to receive a nut. The shaft now can be slipped through the ball bearings that are press-fitted in the drum supports, and the drum and spacers fitted on it. The spacers also are cut from $\frac{3}{8}$ -in.-i.d. tubing. Between the drum and the bearing on the pulley end of the shaft, the spacer is $1\frac{1}{2}$ in. long; between the drum and the opposite bearing, the spacer is $\frac{5}{8}$ in. long. The spacers bear against steel washers fitted at each end of the drum. The drum is held on the shaft by a $\frac{1}{8}$ -in. pin driven in through the nuts.

Idler-Drum Assembly

Each end of the idler drum is counter-bored to a diameter of $1\frac{1}{16}$ in., deep enough to accommodate the flanged ball bearings which have a $\frac{1}{4}$ -in. i.d. and an $1\frac{1}{16}$ -in. o.d. Before fitting the bearings in the drum, a spacer $3\frac{1}{2}$ in. long is inserted. This spacer is cut from tubing having a $\frac{1}{4}$ -in. i.d. and a $\frac{3}{8}$ -in. o.d. Two spacers, also cut from the tubing, then are fitted on the drum bearings and the drum supports. The idler-drum shaft is a $\frac{1}{4}$ -in. rod $5\frac{5}{16}$ in. long, ends of which are threaded $\frac{1}{4}$ -28 and fitted with nuts.

Adjustable Idler-Drum Supports

Adjustable supports for the idler-drum shaft can be made by cutting sections from a steel angle and welding $\frac{1}{16}$ -in. bolts to them. An alternate method is to use two clevises that will provide supports when one side of each clevis is cut off to form an L-shape.

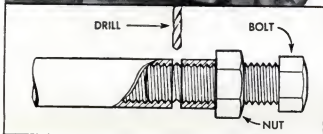
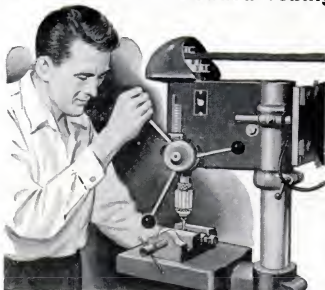
After the drum-support plate is screwed in place, drill down through the two $\frac{1}{16}$ -in. holes in it, into the spacer block, so the bolts of the drum supports can be inserted their full length. Fit the drum supports on the drum and turn on the shaft nuts until they are snug. Then insert the bolts of the supports into the holes of the support plate and tighten the shaft nuts firmly. This latter operation assures that the supports are parallel.

The completed sander now can be bolted to a bench or table and connected to a motor. A 3-in. V-belt pulley is used on both sander and motor so the sander runs at a standard 1750 r.p.m. If it is desirable to sand at slower speeds, use a 1 or 2-in. pulley on the motor. To install the belt, lower the idler-drum supports. When the belt is in place, raise the supports until the belt is snug. Start the motor and center the belt by turning the nut on one support to raise or lower one end of the drum. ★ ★ ★

Photo Fluid on Lathe Faceplate Prevents Work From Slipping

When making faceplate turnings that are held only by the center screw on a woodworking lathe, one craftsman applies photo-retouching fluid to the faceplate so that the turnings will not slip. Since the fluid has a rosin base, a satisfactory substitute may be made by dissolving ordinary lump rosin in turpentine.

Bolt Turned in Threaded Tubing Prevents Drill-Bit Breakage



Drilling through a length of internally threaded tubing often results in a broken drill bit or misaligned holes, caused by the tip of the bit being forced to one side by the threads. To avoid these problems, simply screw a bolt having the same type threads into the tubing. A nut on the bolt is jammed against the end of the tubing to prevent the bolt from turning. Drill through both tubing and bolt. When the bolt is removed after the drilling, it also removes any burrs caused by the drilling.

Aluminum Tea Infuser Used as Small-Parts Washer

Small parts from a disassembled clock, carburetor or other object are easy to clean when placed in a tea infuser of the type shown. Suspend the infuser containing the parts in a tall can filled with a cleaning fluid, allowing sufficient time for grit to soak loose. Then, dip it in the solution several times, until all foreign matter is rinsed from the parts. Holes in the infuser can be enlarged, if desired.



A. Zanelli, Tampa, Fla.

Air Cleaner on Electric Motor

Fine screen wire coated with oil and fastened over the open bell ends of a small electric motor will help reduce dust deposits inside it, which may cause overheating, or even short circuits. The screen wire may be slipped under bolt heads to hold it in place. Foreign particles larger than the mesh openings of the wire will be excluded entirely and much of the fine dust will adhere to the oil-coated wire. It is necessary to keep the wire screen fairly clean to permit air circulation through the motor.

Wrench for Socket-Head Screws Improved From File Tang



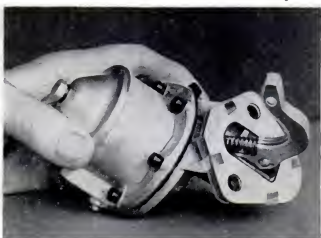
When necessary to adjust socket-head screws, such as the setscrew on the pulley of an electric motor or on other household appliances, the tang of a three-sided file can be used as a socket-head wrench. Break off a part of the tang for the required fit and use a pair of pliers for leverage to turn the improvised wrench. Do not apply too much pressure on the file tang since the metal is quite brittle.

George C. Mattis, Birchwood, Wis.

Cellulose Tape Holds Gasket When Assembling Engine

A few pieces of cellulose tape can be used to keep gaskets aligned when bolting units, such as the fuel pump shown, onto an automobile engine. The tape is so thin it need not be removed when the part is bolted down against the gasket.

O. A. Nelson, Seattle, Wash.



X443

SN 57



KNOW YOUR SHOP MOTORS



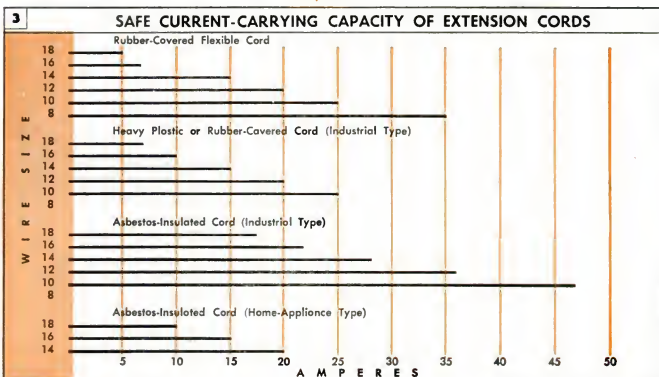
By J. R. Williams

PART I

ALTHOUGH THERE ARE few wear parts in an electric motor, neglect and misuse can cause failure of the unit long before it has delivered a full measure of the hours of service built into it by the manufacturer. Common causes of failure are overlubricating, lack of lubrication, overloading and operation on excessively high or low voltages.

Fractional-hp. motors used on household appliances, home-shop machines and certain industrial applications usually are of the split-phase type or the capacitor-start type, Fig. 4. The motor selected depends

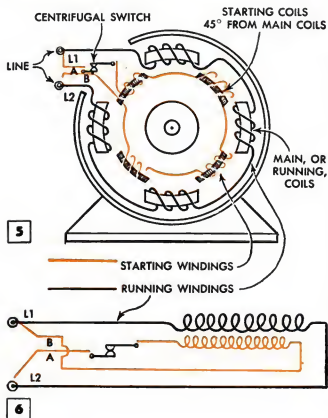
largely on the type of service required. Split-phase motors develop full power at constant speed but will start only very light loads, and the initial current surge during the starting period is very high. For medium-heavy starting loads and comparatively low current requirements during the starting period, the capacitor-start motor is usually the best selection. For starting exceptionally heavy loads with the minimum current requirement the repulsion-start induction motor is essential. These terms refer to the type of starting unit built into the motor. The motor's ability



COMPARISON CHART

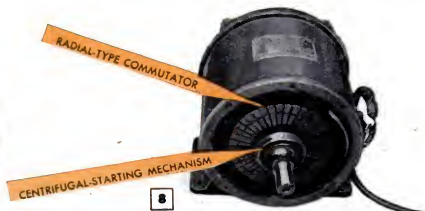
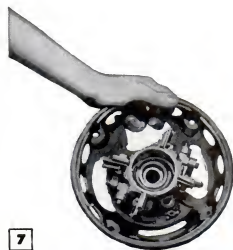
Motor Types and Characteristics

Motor Type	Characteristic	Starting Current Requirements (Approx.)	Suggested Application
Split-phase	Low starting torque; low initial cost	5 to 7 times greater than the current required for running	Washing machines, Ventilating fans, Polishing heads, Belt sanders
Capacitor-start	Starting torque 2 to 4 times greater than running torque	3½ to 4½ times greater than required for running	Water system, Small air compressor, Stoker, Large bench saws
Capacitor start-and-run	Starting torque comparable to capacitor-start type	Approximately the same as the capacitor-start	Suitable for units requiring frequent starting
Repulsion-start induction motor	Starting torque 3 to 5 times running torque	2 to 4 times the running current	Hard-starting equipment: Centrifugal pumps, Compressors



to drive the load at its rated speed after starting usually is determined by the hp. rating. Split-phase motors are not ordinarily supplied above ½ hp. The other two types come in a wide range of sizes. The capacitor-start, capacitor-run motor is not regularly made in the fractional-hp. sizes.

Before purchasing a used fractional-hp. motor, connect it to the power line and close the switch. If it fails to start, open the switch immediately and wrap a cord several turns around the pulley, Fig. 1. Spin the armature (rotor) by pulling on the cord and simultaneously close the line switch. If the motor then runs at full-rated speed, the trouble likely is in the centrifugal switch. This can be corrected later by removing the end shields, first unscrewing nuts on the bolts holding the shields in place. Before dismantling it's a good idea to punch-mark the shields and frame, Fig. 2, so that the parts can be properly located when reassembling. A light tap on the end of the shaft, Fig. 21, usually will loosen the end shield without damage. Removing the end shields will reveal the starting and running windings and the starting mechanism. On repulsion-start motors the starting mechanism will consist either of a



radial-type commutator, Fig. 8, or an axial type, and a brush assembly, Fig. 7. These parts should be thoroughly cleaned and the brushes replaced if worn. On capacitor motors surplus oil resulting from over-lubrication of the bearings may be thrown onto the centrifugal switch, causing arcing at the points. A thorough cleaning of the points usually cures the trouble, permitting the motor to start readily.

Nearly all split-phase, capacitor and repulsion-start motors can be reversed either by interchanging the leads on the terminal plate or by shifting the position of the brushes. Figs. 5, 6, 11, 12 and 13 show the common procedures in reversing fractional-hp. motors. As an example, reversing leads A and B, Fig. 5, to the positions shown in Fig. 6 will reverse the motor. On some types of repulsion-start motors the brushes are mounted on a movable ring, or spider, having a pointer moving between index marks at some point on the outside of the end shield. Loosening a screw and shifting the pointer from one mark to the other will reverse the motor. Certain fractional-hp. motors also can be arranged for operation on 110 or 220-v. current (115-230) either by shifting bus bars or by interchanging leads at the terminals. A and B in Figs. 14 and 15 are examples. However, it should be remembered that while principles remain the same, not all motor manufacturers' specifications are the same, especially when referring to older-type motors. In any case, it's a good idea to obtain from the manufacturer a wiring diagram showing how to reverse the motor or change the wiring for operation on a higher or lower voltage. When necessary to remove the terminal plate, be sure it is replaced in the same position, Fig. 20.

WIRE SIZES FOR MOTOR WIRING

Distance From Motor to Meter	Recommended Wire Sizes				
	Using 115 Volts.	Using 115 Volts.	Using 230 Volts.	Using 230 Volts.	Using 230 Volts.
	1/4 HP.	1/2 HP.	1/2 HP.	3/4 HP.	1 HP.
Up to 100 ft.	No. 14	No. 14	No. 14	No. 14	No. 14
100 to 200 ft.	No. 12	No. 10	No. 14	No. 14	No. 12
200 to 300 ft.	No. 10	No. 8	No. 14	No. 12	No. 12
300 to 400 ft.	No. 8	No. 6	No. 12	No. 10	No. 10

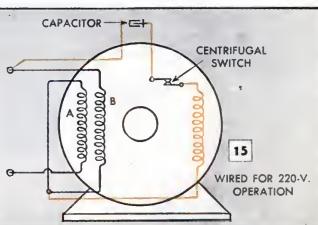
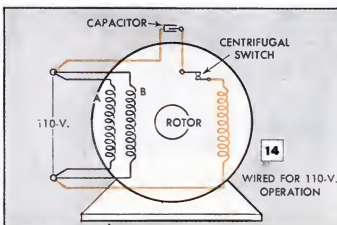
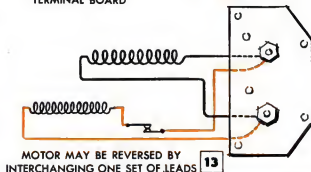
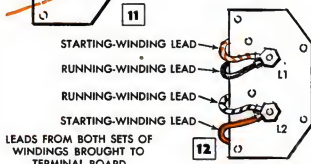
CURRENT-CARRYING CAPACITY OF FLEXIBLE CORDS

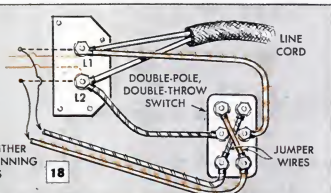
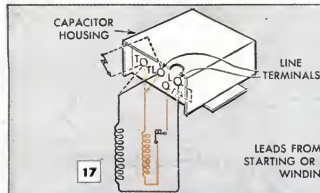
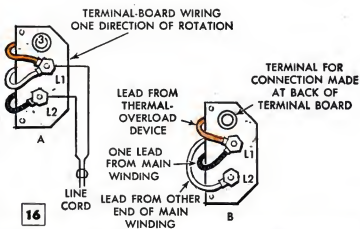
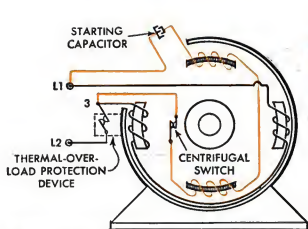
Wire Size	Rubber-Covered Cord	Heavy-Rubber or Thermoplastic-Insulated	Asbestos-Type Cord
No. 18	5 amp.	7 amps.	10 amps.
No. 16	7 "	10 "	15 "
No. 14	15 "	15 "	20 "
No. 12	20 "	20 "	
No. 10	25 "	25 "	
No. 8	35 "		

Overloaded cords overheat, waste current and often fail to deliver sufficient current to run motors at top efficiency.

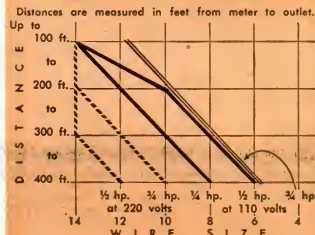


TERMINALS L1 AND L2 ARE THE LINE-CORD TERMINALS. IN CERTAIN MOTORS TWO LEADS ARE BROUGHT OUT TO FACE OF TERMINAL PANEL AS SHOWN. THESE MAY BE EITHER RUNNING-WINDING LEADS OR STARTING-WINDING LEADS. REVERSING THESE LEADS WILL REVERSE MOTOR





19 WIRE-SIZE REQUIREMENTS FOR ELECTRIC-MOTOR WIRING

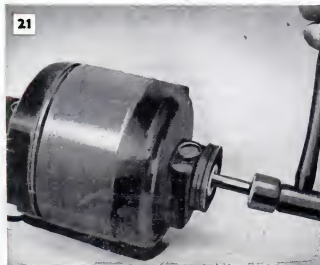


To determine wire size required follow distance line across until motor line is intersected; vertical line at point of intersection gives recommended wire size.

Some capacitor motors in fractional-hp. sizes are fitted with a thermal overload-protection device, Fig. 16. Details A and B show the terminal-plate connections for two directions of rotation. Note how the leads are interchanged to reverse the motor. On some older-type motors the terminal plate is mounted on the capacitor housing, Fig. 17. Terminal T is used when a thermal overload switch is wired in the circuit. Capacitor motors can be reversed by wiring a reversing switch, Fig. 18, into the circuit.

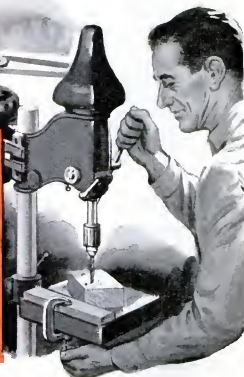
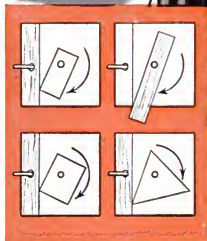
Figs. 3, 9, 10 and 19 give important information on recommended wire sizes and cord lengths. Use of the correct wire size prevents damage to the motor from low voltage and also prevents heating of the cord. Recommendations are only general.

(Continued next month)



"Backstop" on Drill-Press Table Prevents Work From Turning

A $\frac{3}{4}$ x 2-in. length of wood clamped to the table of a drill press, as shown, will prevent work from rotating with the drill bit, or turning suddenly. The latter may happen when the work is held by hand and it turns free, which might cause personal injury. This "backstop" also will save drilling time, since nearly any shape of work can be accommodated, as shown in the diagram, while one hand is left free to operate the turnoff switch, move and replace stock. For very small work use a wider piece of wood, or clamp the backstop adjacent to one edge of the work to keep it from turning.



Large Portable Feedbin Built on Spreader Frame

The large-capacity, completely portable feedbin shown in the photograph was built on the frame and running gear of an old manure spreader. The spreader bed was removed and a smooth floor laid over the metal frame. The framework of the bin then was built up from regular studding and covered with galvanized corrugated roofing. The roof is removable for easy refilling. The side and end doors can be partly boarded to allow the grain to settle as it is removed.

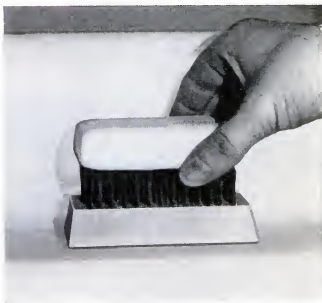
Upturned Brush Is Soap Dish

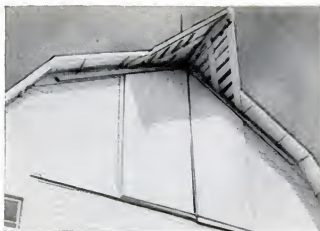
Soap at the shop or farm wash-up sink gets wasted and messy because it is left on the sink edge in contact with water. A remedy for this is to turn a handbrush upside down and place the soap on the bristles. A small amount of soap is deposited on the bristles for later use.

Soapy Water Softens Stiff Rope

Rope which has become stiff and difficult to use can be reconditioned by soaking it for a short time in a solution of very hot soapy water. When the rope appears soft and pliable remove it from the container and allow to dry.

Howard E. Moody, Upper Jay, N. Y.





Haymow Doors Counterweighted For Easier Operation

Lifting the counterweights attached to the doors of the haymow on this barn is all that is necessary to open them. The doors are suspended on rollers which run on enclosed tracks running beneath the roof overhang. A rope attached to each door near the peak runs to the doorframe on the side opposite the door and down to a heavy counterweight. The doors drop down behind a long wooden guide which keeps them from flapping whether open or closed.

Feed Bunk "Roofed" on One End To Protect Mineral and Salt

One end of this outdoor grain and hay bunk built on one side of a cattle pen is partitioned and "roofed" for mineral feed and salt. This protection serves to keep out litter and chaff and prevents rain from falling on the water-soluble minerals contained in the special feeding bin. Capacity is one sackful.—Iowa State College, Ames, Iowa.



CURVED RAFTERS Made Without Glue

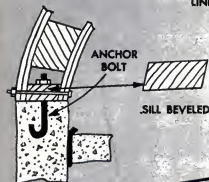
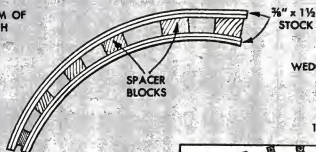
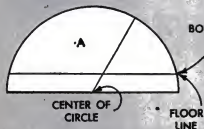
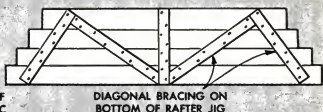
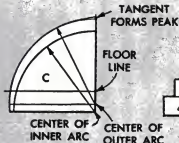
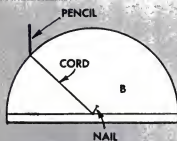
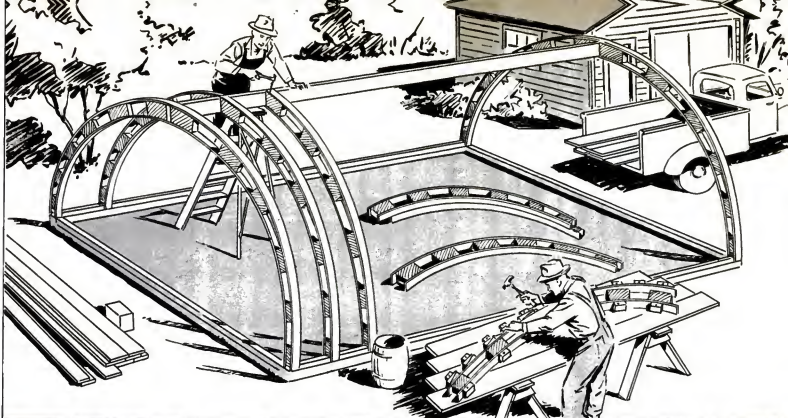
By Louis Martin Reitz

THIN WOODEN STRIPS spaced and bent in a jig of predetermined radius make rigid, serviceable rafters for farm outbuildings and other small structures which may be subjected to heavy snow loads or high winds. Rafters can be designed to form walls and roof in one unit, the lower ends anchored at the sills, or vertical walls can be carried to the desired height and the rafter ends anchored to plates. In either type of structure the rafter layout, shown in details A, B and C on the opposite page, is much the same. No glue is used in the construction, the two pairs of strips being nailed to spacer blocks.

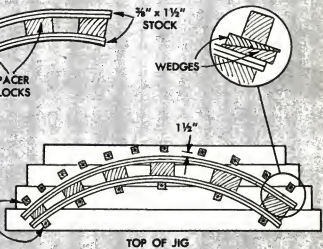
As the first step, determine the required radius by striking the inner and outer arcs as in detail C. Then construct a jig by cleating several boards edge to edge to give the required width and length. Determine from this, and detail C, the size of the spacer blocks, noting especially that the top edge of the upper, or peak, block is cut at a tangent to the rafter curve, as in detail C and the view of the assembled rafter. Ends of the strips also extend beyond the peak spacer to half-lap the ridge board. Bending is done in the jig by means of blocks of hardwood attached to the jig with screws or bolts. When the parts have been wedged in place, the strips are nailed to the spacer blocks. Nails are driven into the spacers at an angle as in the lower left-hand detail on the opposite page.

Sills (also plates where used) are beveled to obtain a flush fit of the rafter strips at the lower end. A bolt passing through the lower ends of the strips and the sill holds each rafter unit securely in place. Some builders use a 4 x 4 sill to give a greater bearing surface.

On small structures the rafters can be assembled as single units and raised into position without attaching to a ridge board. When this is done it may be necessary to draw the lower ends into position with a twisted wire or rope as in detail D. In larger structures, a ridge board adds strength and rigidity to the framing. Note in the lower left-hand detail, opposite page, that the rafter units are tied at the peak with a strip of sheet metal nailed to the spacer blocks. Although not shown in the detail, a second strip of sheet metal nailed across the bottom of the arch will add to the strength of the structure. When a ridge board is not used rafters should be tied at the peak with 1/2-in. plywood gussets. ★ ★ ★

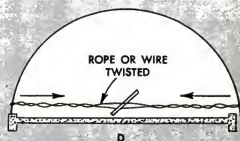
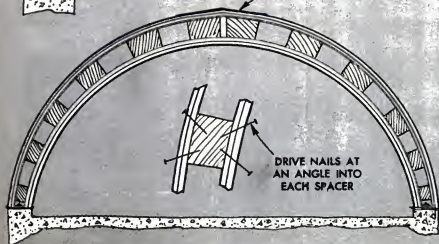


WEDGE BLOCKS
BOLTED IN PLACE

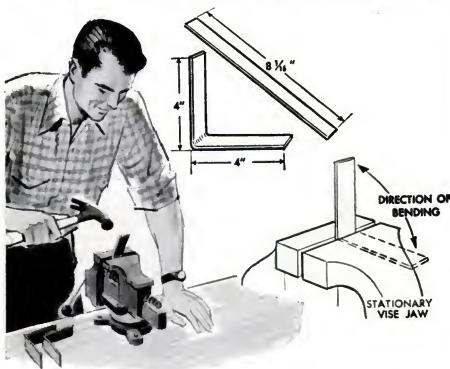


TOP OF JIG

18-GA. STEEL STRIP
24\"/>



Making Accurate Right-Angle Bends in Bar Stock



When a metal round or flat bar is to be bent at right angles, it is necessary to increase the length of a piece by one half its thickness. For very accurate results add a trifle more than one half of the stock thickness so that both ends can be filed down to exact dimensions. Mark stock at the point of the bend, then grip it in a vise so the mark comes to the edge of the stationary jaw. Hammer toward the stationary jaw of the vise, since that jaw can take more strain than the movable jaw. To keep the bend sharp, hammer the stock close to the vise jaws.

Reflective Tape on Headlights Eliminates "One Eyed" Hazard

A small piece of reflective tape on each of the headlight lenses on your car will eliminate the "one eyed" danger presented if one of the lights burns out while driving on a highway. The tape indicates to approaching traffic which of the lights is burned out, thereby giving the exact position of the vehicle and assuring safe travel until the defective unit can be replaced.

R. C. Johns, Flint, Mich.

Loose Slide Fastener Repaired

When a slide fastener on clothing will not stay closed, squeeze the slide with a pair of pliers to compress the grooves slightly. Be careful not to crush the slide. Sometimes better control of compressing the grooves can be had by using a hammer instead of pliers.



Distributor-Point "Lapped in" With Sandpaper on Cam



To assure that a distributor-point setting remains correct for a maximum length of time, one mechanic "laps in" the fiber block on the movable point to fit the cam. A strip of sandpaper is wrapped around the cam and the distributor shaft is rotated until a streak of white the width of the fiber block shows on the paper. The sandpaper then is removed and a small amount of light grease is wiped on the cam lobes to lubricate the fiber block.

Removing Chips From Blind Hole

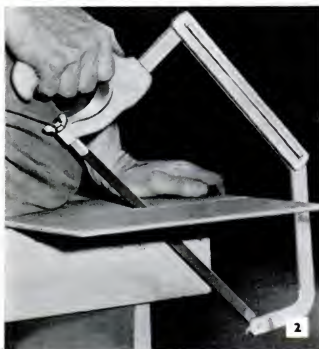
Filling a tapped blind hole with kerosene will dilute the cutting oil still clinging to the sides of the hole so the metal chips can be shaken out or otherwise removed. If the workpiece is small, move it in a circular manner while pouring out the oil. If the workpiece is large, absorb the oil with waste then blow out the chips with air.

SHOPPING FOR TOOLS



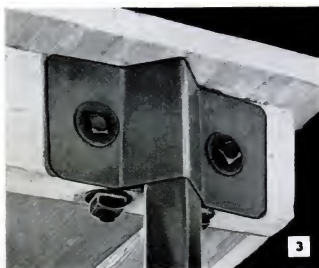
1. MASONRY DRILL is fitted with an integral water-injection system for cooling the diamond drill bit. Drills holes from $\frac{1}{4}$ to 2 in. in dia. through concrete, glazed tile, brick and stone. Hose connects to any water faucet, or unit can be fitted with a special pressure tank which will supply water for 30 minutes

Moleco Drilling Machines, 110 20th St., N.W., Washington 6, D. C.



2. HACKSAW has a special frame which adjusts to increase blade-to-frame capacity 4 in. This feature permits user to cut wide stock. Adjustment from regular-depth frame to high position pictured is simple. No blade change is required. Equally rigid in both positions. Takes standard-length hacksaw blades

Mansfield-Zestger Mfg. Co., 2000 Water St., Cuyahoga Falls, Ohio



3. BENCH-LEG BRACKET holds angle-steel legs rigidly in position on tables, sawhorses and benches. Cut leg to length from 1 or $1\frac{1}{2}$ -in. steel angle, slip the upper end between the two members of the bracket and tighten two bolts. Brackets attached to table or bench rails support leg at angle of about 10 deg.

The Lee Co., 406 Griswold St., Elgin, Ill.



4. FILE GUIDE is designed to aid in sharpening circular-saw blades without removing blade from arbor. It consists of two specially shaped jaws which clamp onto that portion of blade above surface of saw table by spring action. Guide rods, positioned by slides which engage the miter-gauge grooves, keep jaws in same relative position. Hardened rollers serve as guides for the three-cornered file as pictured

Riverside Enterprises, 316 Riverside, Corning, N. Y.

5. SELF-EJECTING CHUCK KEY provides positive protection against injury from a flying key inadvertently left in chuck as drill press is started. Self-ejecting key operates geared chuck in same manner as standard key, but it must be held in position against pressure of a spring-loaded plunger which is recessed into the side of the key spindle as pictured. A self-ejecting lathe chuck wrench also is available

Lindstrom Mfg. Co., 173 Water St., New York City 38

6. CENTER-POINT LOCATOR eliminates guesswork, also saves a lot of time measuring to find precise center of stock. Simply place tool on face of stock as pictured, with legs at the ends engaging the edges of the material. Then insert a pencil point through the hole and mark the center of the stock. To draw center line hold locator in same position and move along the length of the stock as indicated

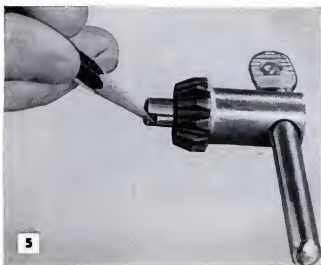
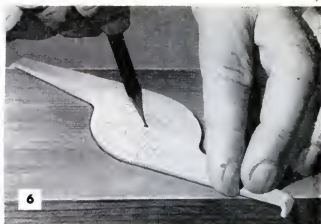
F. V. Gard Tool Co., Box R23, Springfield, Ill.

7. SOFT HAMMER comes equipped with interchangeable heads of aluminum, brass, copper, nylon and three hardnesses of plastic, soft, medium and very hard. Weight of hammer with various heads ranges from 14 oz. to 2 lb., 2 oz. Two types of handles are available, one in varnished wood, the other with a special nonslip safety grip. Body of hammer is 1½ in. in dia., and 2½ in. long. With heads length is 4½ in.

Hi-Lok Mfg. Co., 1625 Mason Rd., Akron, Ohio

8. SAWHORSE made from steel tubing will support a 500-lb. load. Comes with tubular extensions which enable user to adjust from sawhorse height of 24 in. to table height of 30 in., a feature which greatly increases the range of usefulness beyond that of the ordinary sawhorse. The extensions adapt the units to use as legs for picnic tables, display tables, long banquet tables and portable shop benches

Tube and Metal Forming Corp., 940 N. 20th St., Columbus 19, Ohio



SHOPPING FOR TOOLS



9

9. TAP-CHASER HOLDER, or chuck, has recently been developed for use with a universal form relieving fixture of the type shown in photo at the left. New holder permits radial relieving of a complete set of collapsible top chasers in a single grinding operation, setup being made as pictured. Holder solves the problem of obtaining precisely the same radial relief on each of the four chaser blades in order to attain the correct cutting balance and prevent overloading and possible breakage of the blades.

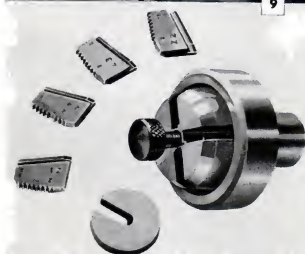


PHOTO AT LEFT is an enlarged view of the chaser holder pictured in the machine setup in the upper photo, No. 9. Holder, which is furnished as an accessory, consists of a slotted head into which the four chasers are inserted and held in place with a C-type retaining washer and knurled screw. Tightening the latter secures the four chaser blades in the head. The assembly is then inserted in the collet chuck of the fixture and the chamfers ground as in the upper photo to precise radial relief.

Royal Oak Tool & Machine Co., 29800 Stephenson Highway,
Royal Oak, Mich.



10

10. VARIABLE-SPEED DRIVER for wood screws is fitted with a cone clutch which not only enables user to control speed at which screws are driven, but also prevents stripping of screwheads and screw breakage due to undersized counterbores. Takes snap-in bits for ordinary slotted screwheads, Phillips heads, also countersinks and hex-head screw and bolt drivers. Cone-type friction clutch permits operator to seat screws to uniform tension required in certain types of assemblies. Used with 1/4-in. electric drill.

The Stanley Works, New Britain, Conn.



11

11. DRY LUBRICANT comes in a squeeze-type dispenser and is used dry on bearing surfaces. Does not soil hands or clothing, a feature which makes it especially suitable for lubricating tools, locks, window channels, file cabinets, slide fasteners and sewing machines. For lubricating bearings on household appliances, small motors and motor-driven tools only a small quantity is required, usually one "puff" from the dispenser will do the job. Won't melt or freeze and can be added to light oils as a supplement.

Reardon Products, 2109 S. Adams St., Peoria 2, Ill.

High compression and high octane demand **BALANCED HEAT**



Today's high-compression engines and high-octane gasolines demand high-performance spark plugs with characteristics that prevent loss of compression and provide for burning away combustion deposits. AC Spark Plugs with *exclusive* Conductaseal and Hot Tip maintain this peak performance through *balanced heat*.

1. **CONDUCTASEAL** eliminates gas leakage between the center electrode and the insulator. It's metal and ceramics fused to form the world's first current-conducting spark plug seal.
2. **HOT TIP** is recessed around the center electrode to heat up fast and burn away combustion deposits as soon as they form. It stays cleaner longer — boosts power — saves up to one gallon of gasoline in ten.

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AC SPARK PLUG



THE ELECTRONICS DIVISION of GENERAL MOTORS

APRIL 1956

221

ANNOUNCING:

6 major changes

to bring great new scope

Kodak Verichrome Pan
Kodachrome
Kodachrome TRI-X
Kodachrome
Kodachrome
Kodachrome
Kodak Panatomic-X

in Kodak Films

to your picture taking!

KODAK BLACK-AND-WHITE FILMS

1. Verichrome goes panchromatic!

Kodak Verichrome Pan and Plus-X Films—For all-around picture making, amateur or professional, indoors or out. *Verichrome Pan* has a brand-new emulsion which yields crisp snapshots, attractive enlargements. *Plus-X* (in 35mm size only) has also been improved. Both Verichrome Pan and Plus-X render *all* colors in pleasingly natural tones of black-and-white... both have been given extra speed without sacrificing fine grain or sharpness. Try them—they'll become your favorites for everyday use!

2. Panatomic-X is back again— and finer than ever!

Kodak Panatomic-X Film—For ultra-fine grain and extra sharpness. This all-new, thin-emulsion, micro-fine-grain film yields top quality prints and *big* enlargements of extra-image sharpness. Of special interest to those who process their own negatives is its wide latitude, rapid developing time. In the recommended Kodak developer, fixer, and hypo clearing agent, total processing time, including wash, is less than 20 minutes! Dries faster, too.

3. New Kodak Tri-X Film— fastest black-and-white roll film ever!

Kodak Tri-X Film—For true s-p-e-e-d when you need it! Perfect for getting fully exposed negatives under the toughest available light situations. Permits faster shutter speeds for action shots, smaller lens openings for depth of field. Kodak Tri-X negatives yield prints with high definition and a full tonal range throughout the shadow, middle, and highlight areas.

KODAK COLOR FILMS

4. Kodacolor now works indoors and out!

Kodacolor Film—For big, full-color album prints. New dual-purpose Kodacolor Film is sharper, faster, easier than ever to use. You can shoot outdoor pictures in daylight, or indoor pictures by clear flash, on the same roll of film—without filters! Produces pleasing color prints even in simple cameras—as well as in cameras with adjustable shutters. Available in all popular roll-film sizes.

5. New Kodak Ektachrome— three times faster than ever!

Kodak Ektachrome Film—Produces brilliant color transparencies for hand-viewing or projection. Extra speed makes it ideal for shooting under difficult light conditions... or when you need extra shutter speed to stop fast action. Your dealer can have your Ektachrome Film processed into transparencies, or you can do it yourself with a Kodak E-2 Processing Kit. Color prints from Ektachrome transparencies can be ordered through your dealer. Available in miniature and popular roll-film sizes in both Daylight Type and new Type F.

6. New Type F for both Kodachrome and Ektachrome.

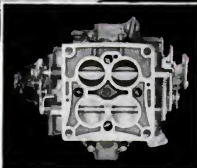
Kodachrome Film—For crisp, sparkling transparencies of finest image quality. Traditionally a favorite for making color slides to be hand-viewed or projected, Kodachrome Film, Type F, is now balanced for use with clear flash. Color prints from Kodachrome transparencies can be ordered through your dealer.

Kodak Color Films above are now priced without the cost of processing included.

Eastman Kodak Company, Rochester 4, N. Y.

Kodak
TRADE MARK

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Control Insect Pests

Q—I've recently moved to a new location where I have a vacant lot adjoining that on which my home is built. I'm new at gardening and I want to know beforehand how to control the common insect pests, that is, those that attack vegetables during the growing season. I want to have the materials at hand so that I'm ready for them. What poisons do I buy? What sprayers and dusters should I have at hand?

—A. K., Ind.

A—Only a few years ago there were sprays and dusts composed of inert materials and rather violent poisons for just about every bug and blight that invaded the vegetable garden from the time the seed was planted until what was left of the crop was harvested. But nowadays your local dealer can supply you with dusts and sprays of a low toxicity to humans but very effective in holding insect invaders at bay. Some of these are multipurpose, that is, they are useful against a number of insects when applied according to instructions. Many of the dusts and sprays are supplied in special containers having a built-in applicator and to use them effectively one must follow the instructions in all details. Usually full directions for use are printed right on the container, thus saving you the trouble of reading and remembering all the details that might be contained in a separate manual.



Garden Tractor

Q—I have about 1/2 acre available for a garden and I would like to purchase a garden tractor to save myself a lot of hand labor in preparing the soil for the crop, also for cultivating and moving and perhaps pulling a small trailer. But what size tractor and implements to buy has me puzzled. Can you list the equipment best for my purpose?—C. N., Ind.

A—We assume you plan to do intensive gardening for several years. If for only a season or two, then it will hardly pay you to purchase a tractor

(Continued to page 226)

For years Weldwood® Plastic Resin Glue has been the "Old Reliable" of professional cabinetmakers. Now, more and more hobbyists are using this "pro" glue. It's the best wood glue made! Makes glued joints stronger than the wood itself. The joints actually grow stronger with age. Weldwood Plastic Resin Glue is highly water-resistant too! Try it today.



You save a lot of time when you can machine a job just 20 minutes after gluing! Hobbyists who use Weldwood Presto-Set® Glue often do just that! Presto-Set Glue is ready-to-use! Sets fast! Bonds like magic! It's the first white glue worthy of the Weldwood name. Bonds wood to wood, wood to cloth, cloth to paper, upholstery fabrics to wood, and many, many other combinations! Let this Wizard with Wood speed things up around your workshop!



It's a real shop tool. Runs glue into grooves, dowel holes, hard-to-reach-corners—quicker, cleaner. No waste. Get one today!



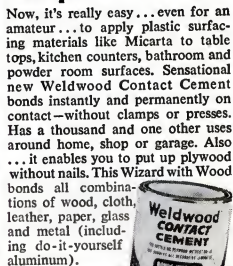
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Satinlac,[®] Firzite[®] are
available at all hard-
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dealers.**



Many hobbyists have been wondering how professional painters get those beautiful natural wood finishes. The magic word is Satinlac! Satinlac gives a handsome, satiny effect which wears well and is easy to maintain. Dries so quickly it's ready for the next coat in just 3 or 4 hours. In a jiffy you have a "custom-finished" job!



Now it's easy to give fir plywood the appearance of costlier woods. When staining, start with a coat of Clear Firzite. It soaks into the wood pores and subdues the wild grain. Practically eliminates grain raise and face checking. For oak, walnut and mahogany stains, add colors-in-oil.



Now you can give furniture a blond woody finish without a "painty" or artificial look! Finish it yourself with White Firzite. This Wizard with Wood is equally wonderful for getting an eye-catching pickled finish. For tinted effects add colors-in-oil. (On soft wood or fir plywood paint jobs, White Firzite as an undercoater helps prevent grain raise and checking.)



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(Continued from page 224)

and equipment. You can hire plowing, disking, harrowing and rotary tilling done for a few dollars in most communities. However, if you enjoy working with a tractor, perhaps that will prove to be at least a partial return on the investment. Garden tractors come in a range of power sizes and types. Some small tractors are designed to pull all implements, plows, harrows, cultivators, lawn mowers and the like. Others are designed for front-mounted implements, that is, the units are mounted ahead of the drive wheels and are pushed rather than pulled. Both tractor types are good, but as a rule the selection should be made on the basis of the type of work to be done, rather than personal preference. Many gardeners prefer front-mounted implements for working in comparatively small, irregularly shaped plots, as the tractor is more maneuverable and easier to handle in close quarters. On the other hand, for working especially stubborn soils, the pull-type tractor may prove to be the most satisfactory. Some also prefer it for cultivating row crops where the rows are long and there is plenty of turning room at the headlands. Although not tractors in the strictest sense of the term, rotary tillers do classify as power-operated garden tools. These units also come in a range of sizes suitable for seedbed preparation and cultivating in both small and large plots.



Linoleum Top

Q—We have a linoleum counter top in our kitchen and lately I have noticed that it is beginning to crack at the points of greatest wear, around the sink and directly under the cabinets. The cracks are very fine, just visible on close examination. However, linoleum does not seem to be worn at any point. I've been told to apply linoleum lacquer, but will lacquer stand up under this kind of service? Is there any other finish?—R. E., Pa.

A—If we understand correctly your description of the condition of the top, we doubt that you would find regular linoleum lacquer satisfactory. Ordinarily we would recommend that you consider replacing the top either with linoleum or with one of the new surfacing materials that can be applied with pressure-sensitive adhesives. However, if you wish to extend the life of the present top for a time, then we would suggest that you apply one or more coats of boiled linseed oil. Linoleum will absorb boiled oil to a certain extent and, because of this, the oil will act as a rejuvenator. Apply a first coat and rub in with a soft cloth. Allow to dry for at least 24 hr. and apply a second coat, wiping off any excess oil at the end of a 12-hr. period. Use only boiled oil that is pure.

Concrete Defect

Q—Our basement walls are of solid concrete. The inside surface is unfinished, that is, not painted or plastered. However, I notice that the surface underneath seems to be loose and rather powdery. In several places the defective material has flaked off to a depth of 1 in. or more. Is there anything that can be applied to the wall to stop the flaking and powdering of the surface?—T. H., N. Y.

A—We're doubtful, especially if the defect is due to freezing of the concrete at the time the wall was poured. Of course, there are other possible causes, but freezing seems the most likely, if we understand your description correctly. However, before planning any other remedial procedures, we would brush the wall with a stiff-bristle brush to remove all loose particles and apply a masonry sealer, following the instructions on the container. This material may or may not turn the trick, but we think it is worth trying. We suggest that you permit the wall to stand untouched for a month or more. If the material holds then perhaps it will be possible to patch-plaster the areas affected.



Put up ceiling tile with a Bostitch T5-8 Tacker with Bostitch 9/16" or 1/2" staples. Press nose of tacker firmly into cove formed by tile flange. Squeeze the lever. You can drive three staples 4" apart in about three seconds and go on to next tile. You never mar the face of the tiles, and you can wear gloves to keep them clean.



Apply insulation with either the Bostitch T5-8 Tacker or H2B Hammer, with Bostitch 3/8" staples. The hammer is faster with a little practice. You can drive staples with a flick of your wrist—*much* faster than hammer and nails. One hand is free to position the insulation. Ask your building supply dealer or Bostitch representative.

Best way to install ceiling tile and insulation

In co-operation with leading makers of ceiling tile and insulation, Bostitch has prepared a booklet which gives detailed instructions for installing

Armstrong Cork Company	makers of Temlok® Tile, Temlok® Plank and Cushiontone®.
The Celotex Corporation	makers of Celotex Tile Board and Finish Plank and Celotex Regular and Reflective Rock Wool Blankets.
Infro Insulation, Inc.	makers of Infra Multiple Aluminum Thermal Insulation.
Minnesota & Ontario Paper Company	makers of Insulite Tile Board, Plank, and Interior Board.

these materials. The following firms have contributed information for this booklet and approve this method of installation.

Notional Gypsum Company	makers of Gold Bond Insulation Board Products and Rock Wool Insulation.
Reynolds Metals Company	makers of Reynolds Reflective Aluminum Insulation.
United States Gypsum Company	makers of Twin-Tile, Panel-Tile, Quietone, Auditone, USG Insulation Plank, and Red Top Insulating Wool.
American Sisalkraft Corporation	makers of Sisalkraft and Sisalation.
Wood Conversion Company	makers of Balsam-Wool and Nu-Wood Ceiling Tile.

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Here's Fun From My Bag of Camera Tricks

(Continued from page 131)

to hold it in place if the fit isn't snug. Mirror and rim then sit atop your lens-board inside the enlarger. Experiment a little by shifting the mirror and the negative carrier to get almost unlimited multiple effects.

If this sounds like too much trouble, you can do practically the same thing simply by holding a tiny piece of mirror angled in front of your camera lens when you shoot a picture. The two-headed dachshund and upside-down automobile on page 128 were done this way.

Probably the most absurd and the easiest of trick photos are achieved in the dark-room during the printing and enlarging processes. By superimposing negatives, you can put people inside flash bulbs, bottles and other unexpected places. Elephants can be planted on the Capitol dome! How can you put Aunt Minnie in a flash bulb?

A No. 5 midget flash bulb is placed inside the enlarger where the negative usually goes, supported on a piece of glass. Load a piece of film in the enlarging easel, make the exposure, then develop the negative. You now have a negative of a flash-bulb picture. Expose it on a piece of enlarging paper. Now take your negative of Aunt Minnie and make another exposure on the

(Continued to page 230)

Several new slants on the Leaning Tower of Pisa are added by diamond pattern of glass in the enlarger



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And there are four different Hawks to choose from—4 power choices, 4 degrees of luxury, 4 price ranges—including the lowest!

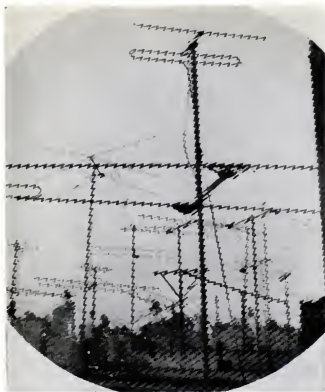
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Lightninglike texture of these TV antennas was made by shooting negative through piece of striated glass

same sheet of paper. This requires careful marking on the focusing sheet to place the subject in the exact center of the flash bulb. It's a simple case of double-exposing two negatives on one sheet of paper.

The same kind of double printing can be done using a bottle instead of a flash bulb

(Continued to page 232)

Two separate negatives projected onto the same paper produced startling photograph of kitten in bottle



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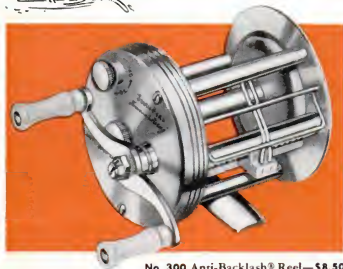
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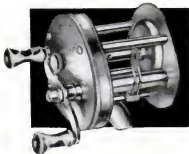


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as "frame." It can be a perfume bottle, pop bottle, any kind at all. Opaque the negative in the center of the bottle where you'll be superimposing the subject, before making your first exposure on the print paper. Now, expose several enlargements of this opaqued negative and develop one of them immediately.

Put the negative of Aunt Minnie in the negative carrier. The developed print of the bottle goes into the easel. Move the enlarger up and down until Aunt Minnie is the right size to fit into the opaqued area. When the subject is properly focused and positioned, tape the easel to the enlarger baseboard and remove the developed print from the easel. Now slip one of the exposed but undeveloped prints into the easel and make a second exposure of the negative that's in the carrier. Develop this print, and Aunt Minnie is right inside the flash bulb or the bottle!

There are many ways this trick can be done. You can paint the bottle white before you photograph it—which does away with having to opaque the negative. Or you can shoot the bottle against a white background, lighting only the background. This negative also can be used without opaquing, and results in a ghostly effect. Experiment on your own. It won't be long before you come up with some striking new ideas.

Prints made with two or more negatives can be ludicrous, are simple to make, and the variety is endless. Go through your old negatives and look for two that will make a startling combination, such as a picture that seems to defy all laws of gravity. That's how I made my shot of the live elephant on the Capitol dome—and here's the technique I used.

First I eliminated the statue on top of my Capitol negative with reducer. After the negative dried, I made a print of the building alone. When the print dried, I focused the elephant negative on it, moving the enlarger down until I was able to reduce the elephant to the proper size. Then I made a print of the elephant which I later copied. Now I was ready to combine both negatives in a montage. I did it by taping them together—one atop the other in perfect position—and slipping them between two sheets of clear glass in a sort of sandwich that slipped into the enlarger neatly.

So much for the negatives in your files. If you're going to shoot new negatives for montage work, here are a few precautions to take.

Daylight shots are simple. Just expose the negative in the usual way. While developing, keep the density on the light side

(Continued to page 234)

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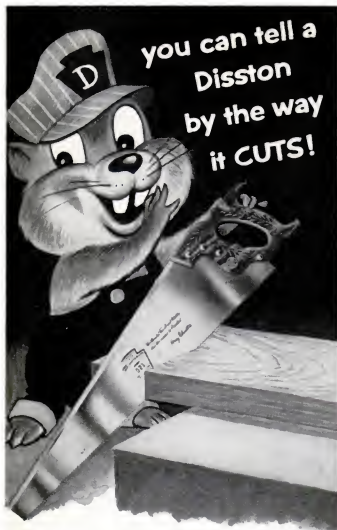


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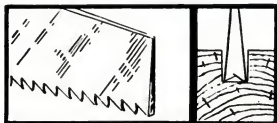
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of the sky light, so that the other negative will get a chance to print through. For the second negative (a circus shot, for example) expose with available light. If you use flash or strobe, you'll pick up the background which you do not want. If, after taking the precaution of using only available light, you still pick up parts of the background, use local reduction methods with Farmer's reducer. That way, you'll be assured of a convincing and startling montage.

Now, let's leave the darkroom and go outside in the dark to take pictures! Believe it or not, you can take pictures in the dark without any visible flash, strobe or other lighting. Years ago I found a way to get prize-winning candid shots. I like people. I like to get them on film as they really are, but you can't if they know there's a camera around. There's no such thing as a "candid camera." It's the photographer who has to be candid. He must pick the right place and time to shoot. The right time is when they're relaxed—when they can hold hands, kiss, dream.

A movie theater was the logical choice for me. Under cover of darkness, people find escape, privacy and seclusion. Under the spell of the screen they are silent without their masks—they are themselves. What a golden opportunity for a photographer to be invisible here.

But one can't photograph in the pitch darkness of a movie theater. There is no lens or film that fast. One can't use flash. There are cash customers. Once a flash went off, it would blind them, probably start a riot. Everyone would know a photographer was on the loose. The obvious solution was to photograph them in the dark. A movie theater being private property, I had to get permission from the manager. And that I got only after I had demonstrated to his satisfaction that I could take pictures in the dark without disturbing anyone.

I used Kodak infrared film and Westinghouse No. 5R flash bulbs. These are mid-sized bulbs, coated with a dark-red color. They throw out infrared rays, which are hardly visible. As I had to walk through the aisles of the theater, I disguised myself as an ice-cream peddler. This was the perfect disguise.

Infrared film is made in only two sizes—4 by 5 and 35 millimeter. The larger size is good for general views, the smaller for close-ups. Infrared film is slow compared with today's high-speed snapshot films. What's more, the light from the bulbs does not carry very far. Because of this exposures on close-ups must be about $\frac{1}{50}$ at

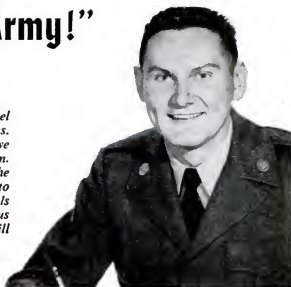
(Continued to page 236)

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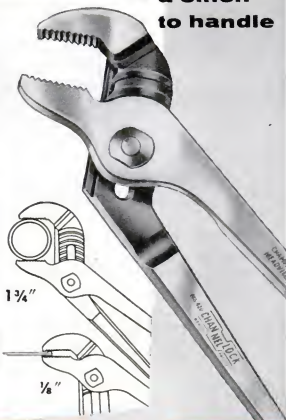
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f:8, at distances of 6 feet and less. For the long shots of 25 feet, which you may make from a theater balcony, use an extension that can be clamped to the railing. Then two bulbs will do the trick.

Focusing is critical in the dark. You can't use a range finder, and you must work fast. But with practice you can guess-focus as I do. For the close-ups I have everything ready—distance set, bulb in the reflector. When I spot something interesting, I snap it without anyone knowing—really candid photography.

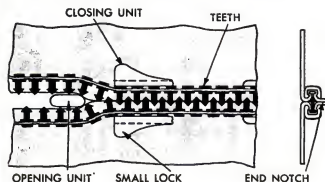
Infrared film produces striking contrasts and needs something like Microdol at three fourths normal development time. And no matter how you expose or develop it, the film does not pick up black well. So, if you have a choice, pick a blonde.

To me, infrared produced the most thrilling set of pictures I ever took. Besides, I saw the show free and had ice cream on the house!

Cameras and enlargers and all of the rest of the gear we photographers use are wonderful inventions. They allow everyone to be inventive. But not everyone who uses them is! Don't do the things that everyone else has done—branch out, explore a little. The fact that something has been done before is one of the best reasons not to do it yourself. The tricks I've disclosed here won't do you any good unless you use them in new ways. Put your own imagination behind them and see if a little ingenuity doesn't put some exciting prints on your wall—and maybe even some blue ribbons in your scrapbook! ★ ★ ★

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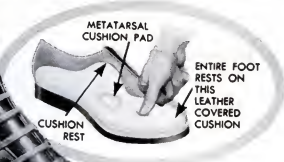


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(Continued from page 101)

When the CAB teams compared findings, the pieces of the mystery fell into place quickly. All evidence indicated the cause of the crash was a bomb, probably home-made and very powerful, placed in Number Four baggage hold. When it exploded, it sheared off the tail and shattered the aft fuselage. The rest of the plane tumbled and twisted down, disintegrating as it fell. This accounted for the odd wreckage pattern and the peculiar wing-tip failures.

This meant sabotage, a deliberate criminal act, which was out of the realm of the CAB men, so the Federal Bureau of Investigation entered the case to find out who had placed the bomb—and why. Meanwhile, CAB men gathered up the wreckage, as they do at every accident, and trucked it into Denver. There, in a hangar, they pieced the fragments together as they would have worked a giant jigsaw puzzle—and proved the theory correct that a bomb was placed on the plane.

Using 500 men, the FBI began an intensive search for the bomb's maker. They began interviewing the relatives of all the victims, hunting for clues. Twelve days after the accident, they reported a confession from 23-year-old John Graham, of Denver, whose mother had been a passenger on the plane. They announced that he admitted putting 25 sticks of dynamite with two electrical caps and a timing device in her suitcase—though he later repudiated this confession. The authorities said he had taken out \$37,500 worth of trip insurance on her life.

The Longmont crash was the first proven case of sabotage to affect a United States air carrier, so the investigation there was not truly typical of the CAB's work. Usually a pilot factor, weather, or structural or mechanical failure is the cause of an accident. And it is here that the CAB's work shows long-term results.

In August 1948, the pilot of a Northwest Airlines Martin 202 cleared with the Minneapolis tower to let down from his 8000-foot flight altitude and make a landing approach. Ten minutes later the plane crashed near Winona, Minn., killing all 37 occupants. From local weather sources, the CAB men learned that there had been a thunderstorm in the path of the plane. Apparently the plane had disintegrated in this storm. But why? The Martin was built to take the buffeting of a thunderstorm. Investigators found the answer two miles back along the flight path, where the remains of one of the wings had fallen.

(Continued to page 240)

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Magnification of the edge that had separated from the plane showed that a small fitting between the wing and fuselage had broken under repeated stress. The turbulence in the thunderhead completed the job of tearing off the wing.

Northwest's fleet of 19 Martins was immediately withdrawn from service, and tests, using fluorescent dyes to bring out flaws, were run on the wings. Five of the planes showed fatigue cracks developing. The manufacturer immediately made structural changes in the wing—and no accident of this type has occurred since.

In August 1955, an American Airlines' Convair 240 left Springfield, Mo., for St. Louis. Shortly afterward, the plane plunged into a ravine near Fort Leonard Wood, Mo., with 30 casualties. From eye-witness reports, radarscope films and recordings of radio conversations, the CAB men put together the story of the flight.

A fire had developed in the plane's right engine while in flight. The pilot used his fire-extinguishing equipment, but this failed to put out the blaze. Aware of the seriousness of his condition, the pilot changed course and headed for Fort Leonard Wood to make an emergency landing. As the fire spread through the engine and into the wing structure, the flight became a race with death. It ended a half mile short of the runway; the burning wing fell from the plane. There were no survivors.

In the scorched and half-melted remains, CAB men traced the horizontal smoke streaks on parts from the right engine. These led them to the Number 12 cylinder, which was sent to the National Bureau of Standards Laboratory in Washington. The report indicated that metal fatigue had developed in the cylinder wall and cracks had resulted. Hot fuel sprayed through into the engine section, resulting in fire.

The CAB men were now faced with a tougher question: Why had the cylinder developed metal fatigue? Were other cylinders likely to do the same? Patiently they went to work tracing the life history of both engine and cylinder. The engine had just been given a major overhaul in the airline's shops at Tulsa, Okla., so they went to Tulsa and checked every step of the overhaul process. They surveyed the methods of record keeping. They reviewed procedures and talked to personnel. And finally they assembled the story.

Engines brought in for a major overhaul are torn down, cleaned, inspected and rebuilt. Damaged and worn parts are marked for discard, and replacements are made. When this engine was torn down, the mechanic found that the cylinder in question

(Continued to page 242)



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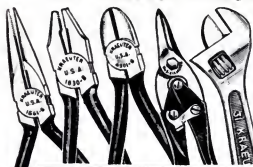
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had suffered an eight-stud failure—that is, eight of the studs which hold the cylinder on the crankcase had loosened. Company regulations state that any cylinder with more than a two-stud failure must be discarded, because such failures create unusual stress, causing metal fatigue. In some manner, this cylinder, though it should have been discarded or rebarreled, was put back into service.

Investigation showed that there were three failures that could have happened to permit the cylinder to go back into service. At the engine disassembly point, a tag alerting inspectors to the damaged cylinder should have been attached. It might have been overlooked. Or, in the high-pressure cleaning process through which the cylinder goes, the tag may have been torn off. Or possibly the alert tag was overlooked by the inspector.

An immediate check was made to learn if other cylinders could have been passed in this manner—and the records showed that 23 had been. These cylinders were recalled before another accident could happen. And as a result of the CAB findings, the metal tags are no longer used. Instead the flange on faulty cylinders is broken with a chisel so they cannot possibly be reinstalled. Five weeks of steady, patient digging by the CAB men, working closely with the airline, solved this particular accident and prevented repetition.

In 1947, a United Air Lines DC-6 burned and crashed near Bryce Canyon, Utah, killing the 52 persons aboard. The cause of the accident baffled even the CAB men for some time. The only substantial clue found in the remains of the fuselage was white ash, indicating a fire with intense heat. Chemical analysis of the ash showed it came from the burning of the emergency landing flares on the plane. In some manner, a fire had reached the flares. Investigators ordered the flares removed from all DC-6s as a precautionary measure, though they knew that they had been only a contributing factor and not the primary cause of the accident.

The parts of the broken fuselage were gathered up and taken to the Douglas plant for a mock-up assembly. Often such an assembly after an accident will bring out facts that otherwise would be hidden.

Less than two weeks after the flares had been removed, a DC-6 belonging to American Airlines developed a fire in flight. This time the pilot made a safe emergency landing—thanks to the fact that the CAB men had taken the precautionary step of removing the flares. All the circumstances of this fire matched that of the Bryce Canyon

(Continued to page 248)

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Perhaps you'd like to change the floor plan. Then you help plan your new home just the way you want it. When it arrives, you erect it yourself in just days and put the \$\$\$ you save in construction costs right in your own pocket. All exterior walls are panelized, all openings accurately cut in. Windows and doors are hung in frames and weather-stripped as complete units, ready for you to insert in prepared openings. Pre-manufactured roof trusses come in two sections—just nail them together. No other build-it-yourself home saves you so much construction time or helps you avoid costly on-the-job mistakes. Unmatched in value, unequalled in low cost, all Pagemaster quality-built Homes are eligible for VA and FHA financing.

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Pagemaster® HOMES

202 PIERCE STREET, SHAKOPEE, MINN.

"EXCLUSIVE NORTHWEST PRODUCER" of — "THE PM PRECUT HOUSE" — "PANELIZED FOR EASY ERECTION"

• automatic •

POWER TILL

- ✦ Tills Automatically
- ✦ Works ALL SOILS!
- ✦ Width: 24" to 7"

SEE YOUR DEALER OR WRITE

UNIVATOR

UNIVATOR, INC., 2030-51 Center St., Berkeley, California

Works in seconds



Loosens Rusted Bolts
nuts, screws, "frozen" parts!

LIQUID WRENCH

AT HARDWARE STORES, GARAGES
SERVICE STATIONS EVERYWHERE

For information write manufacturer:
Radiator Specialty Co., Charlotte, N. C.



Heavy Duty, All Steel
TOOL CHEST

\$24⁷⁵

F.O.B.
ST. PAUL

WHERE ELSE can you get 4 drawers with built-in locking system, sliding on compound glides—at this price! Baked blue-gray enamel. 26" x 12 1/2" x 12 1/2". Your money back if not satisfied! Write for bulletin, describing this and 12 other models.

HUOT MANUFACTURING CO.

555 No. Wheeler St., St. Paul 4, Minn.



EARN GOOD MONEY-Spare or Full Time
IN A BUSINESS OF YOUR OWN...

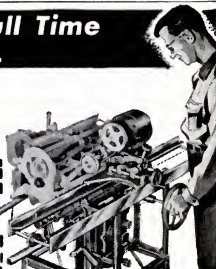
SMALL INVESTMENT — NO EXPERIENCE NEEDED

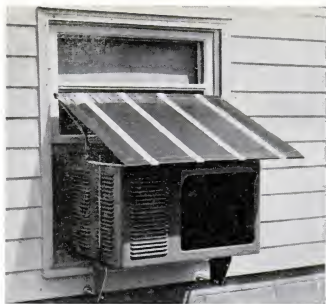
Thousands of men are making big money in their own business. You too, can have a fine income with an assured future in spare or full time with the Universal lawn mower grinder. Investigate our success plan now, it includes everything you need plus facts on how others have earned over \$3,600 in one season, working part time. Act now! Mail coupon today!

ROGERS
MANUFACTURING CO.
Lindsey, Ohio

ROGERS MFG. CO., Dept. M-46, Lindsey, Ohio
Gentlemen: Rush me FREE details on easy inexpensive way to get into my own business.

Name _____
Address _____
City _____ State _____





Sun Shield for Air Conditioner Increases Efficiency

Air conditioners installed in windows where they receive direct sunlight may be as much as 40 percent more efficient when shaded from the sun, according to experiments conducted by the manufacturer of a sun shield. The shield prevents excess heat, which can interrupt the normal refrigeration cycle from building up within the conditioner, and permits the heat removed from interior air to be dissipated properly. It is said that a $\frac{3}{4}$ -ton unit, when shielded, will cool up to 100 square feet more of floor space. Made of heavy canvas coated with a vinyl plastic, the shield is water and fire resistant and is adjustable to fit most conditioners.

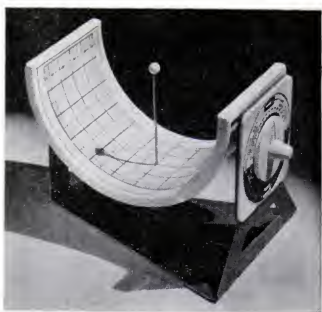
Sinking Town

Gradually the town of Lueneburg, Germany, is sinking into the ground. Houses are falling apart as they sink, and the town council is considering moving the entire town to another site. The present town stands on soil above a salt deposit and underground water gradually is carrying away the salt, causing the earth to cave in.

Dictionary Stand



No matter where you open a large dictionary placed on a new twin-top bookstand, the pages remain level. The heavy side of the book sinks until the pages are leveled across the surface of the open book.



Sun and Shade Around Home Measured on Model

Home builders can plan the location of a new home to take advantage of the best sunlight and shadow conditions by using a shadow-measuring device on a small model of the home before actual construction starts. The device, illuminated by either artificial light or sunlight, will show how the shadows can be expected to fall on the home at any hour of the day and in any season. A small ball mounted on an upright pin casts a shadow on a graph to indicate the month and hour which correspond with the sun's position at that time. A knob permits tilting for various latitudes, so that the device may be employed in the northern or southern hemisphere.

Aerial-Camera Control System

Operation of aerial reconnaissance cameras is fully automatic with the use of an "electronic brain" developed for the Air Force. Shutter speed, iris opening and movement of the film to counteract movement of the aircraft are varied to meet changing conditions. At night, when photo-flash bombs are manually dropped, the control automatically snaps a picture. The control system, containing sensor units, computer units and servo mechanisms, is built in packaged units which are hooked up to control any number of cameras. Weight of a control system may vary from 137 pounds for a few cameras to 400 pounds for many.

ⓈPulverized synthetic mica bonded with glass makes up a "ceramoplastic" electrical insulation material that can withstand the effects of radiation and 1000-degree-Fahrenheit heat.

Just what paste wax needed - a built-in cleaner !



**Johnson's J-Wax
new Paste Wax Discovery
does the cleaning work for you!**

**Start right in waxing! No extra
cleaner needed—nothing else to buy!**

LONG-LASTING WAX
KEEPS FRESH AND EASY
TO APPLY IN THIS
NEW
KEY-OPENING
CAN



Here's what you've been waiting for—a paste wax with a cleaner built right in! Johnson's new J-Wax saves you hours of pre-cleaning. J-Wax takes the dirt off for you—replaces grime with a crystal-clear coating of wax. Even the dirt you can't wash off loosens instantly and disappears as you rub on this new self-cleaning paste wax.

Then watch the high brilliant luster that comes as you buff. J-Wax sets smooth and hard—bonds itself into a long-lasting wax-tight seal. Gives your car tough wax protection it needs for any weather. And look! The colors are far brighter, truer—even the chrome glistens.

Get your car ready now for the months ahead—with J-Wax. It's the easiest, fastest way to genuine wax protection—*paste wax protection!*

FAST

is the word for these efficient little

RIGID

Drop-Head Dies!



Easy threading of your $\frac{1}{8}$ " to 2" pipe

Size head you want snaps into ratchet drive ring from either side—can't fall out. Dies reverse easily for close-to-wall threading. Ask for **RIGID** No. 00R for $\frac{1}{8}$ " to 1" pipe, or any combination of sizes to 2" pipe to fit your needs. Bolt die heads also, $\frac{1}{4}$ " to 1", fit your 00R. Free carrier with sets. For your shop, for your home—buy this handy threader at your Hardware Store.

Famous **RIGID** Pipe Wrench
also gives you most
service for your money!



The Ridge Tool Company, Elyria, Ohio, U. S. A.

Car Radio Doubles as PA System

(Continued from page 163)

tie point where it joins a lead from the speaker. In the receiver shown, one of the lugs of capacitor Co is used as the tie point.

To make the necessary modifications, disconnect the speaker lead from the tie point at C, and solder wire 5 from the control panel in its place. The disconnected speaker lead is then spliced to wire 6 of the panel.

Lead 4 from the control panel can be soldered to any convenient 6-v. point in the receiver. It may be connected directly to the open contact of the on-off switch or to a filament lug on a tube socket.

Note

Though not shown in the illustrations, the wires from the panel must pass through the perforated radio cover before being connected in the circuit. Otherwise, replacing the cover may damage the wires.

In the final connection, lead 3 from the control panel is soldered to a voice-coil lug on the PA speaker. This speaker should be mounted in a weatherproof enclosure, and the speaker itself should be moisture-resistant. Outdoor-theater speakers, available from most radio-parts distributors, are suitable. The speaker must be capable of handling the full power output of the radio.

If the speaker enclosure is made of metal and is fastened directly to the car frame, the other speaker voice-coil lug may be soldered to the enclosure. Otherwise, a wire must run from the voice coil to some point on the car frame.

This system is designed for use with a single or double-button carbon microphone. Most units of this type are provided with an on-off switch. This switch is essential to prevent battery drain when the PA system is not in use. Carbon microphones without such a switch should always be disconnected from the control panel when the PA system is not in operation. ★ ★ ★

Control panel mounted on auto dash. Noncritical parts layout permits design for any available space



Every home workshop needs it!

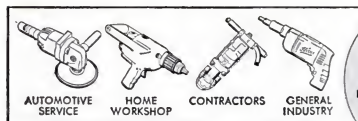
Thor SpeedSander Kit

World's largest selling electric sander



DO-IT-YOURSELF fans find this electric sander perfect for putting a professional finish on unpainted furniture or re-finishing old pieces. Handles irregular curves and flat surfaces. Makes tape sanding fast and easy in dry wall construction. Fine for smoothing metal, plaster or tile, too.

The durability of Thor Speed-Sanders is proved by extensive use in industrial production—the world's largest selling sanders. Complete kit includes everything you need. See it at your hardware store. Speed Way Manufacturing Company, a division of Thor Power Tool Company, Aurora, Illinois.



THOR POWER TOOL COMPANY
Branches in all principal cities



Thor
SpeedSander

15TK KIT

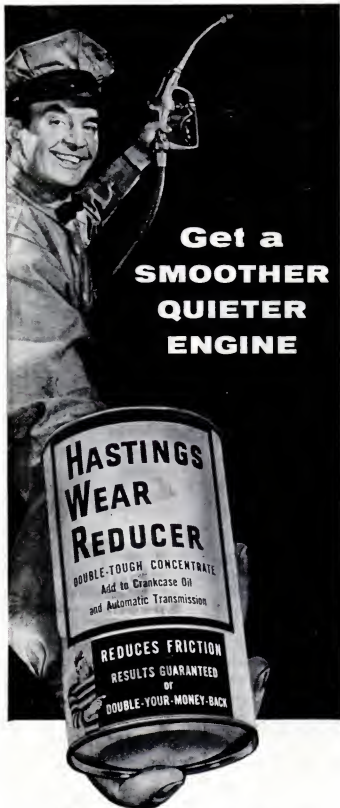
\$29⁹⁵

SPECIAL PRICE
for Hardware Week, April 12-21

Regular price \$34⁹⁵

Includes:

- 1 No. 15T SpeedSander
- 6 grit covers 1/0 80
- 6 grit covers 3/0 120
- 6 grit covers 6/0 220
- 1 template for cutting covers from 9" x 11" sheets
- 2 free-abrasive felt pads
- 1 thick Neoprene contour pad
- 1 lambswool polisher
- 1 instruction manual
- Steel carrying case.



H-W-R keeps engines clean, restores power . . . stops hydraulic valve lifter noise . . . rids your automatic transmission of jar and jerk, too. Results guaranteed or *Double-Your-Money-Back!*

HASTINGS

HASTINGS MANUFACTURING CO., HASTINGS, MICHIGAN
Wear Reducer, Casite, Piston Rings
Oil Filters, Spark Plugs

accident except for the flares, so the CAB sleuths swarmed over the plane.

A long dark stain along the underside of the fuselage in front of the fire area looked suspicious. Chemical analysis showed it was made by aviation gasoline—and the sleuths had the answer to both fires. To keep a plane balanced in flight, the pilots try to maintain the same level of gasoline in each tank. The tanks are interconnected with gas lines, so the gas can be pumped from one tank to another as necessary. In the planes which had caught fire, there had been some overflow as gas was being transferred from one tank to another. Some of it had run along the belly of the plane. As it passed an air intake, it was sucked in and blown into the cabin heater in the “boiler room” under the cabin floor. That was where the fire started. In the Bryce Canyon accident, the heat from this fire had set off the high-intensity flares.

Douglas engineers relocated the gas overflow vent, insulated the landing flares so that outside heat could not set them off, and the procedure used by pilots to transfer fuel from one tank to another was modified. As a result, no similar troubles have occurred on any DC-6s.

Story after story could be told of the work of the CAB safety investigators, but the biggest story of all is in the safety record of the United States' air carriers. In 1938, there were 4.5 passenger fatalities for each 100,000,000 passenger-miles flown. By 1954, the rate had dropped to .075 fatalities per 100,000,000 passenger-miles—and in that year the airlines flew the fantastic total of 35,200,000 revenue passengers a total of 21,900,000,000 passenger-miles. That record tells the story of the CAB's Bureau of Safety Investigation better than anything else could. ★ ★ ★

Case of Mistaken Identity In 44-Year-Old Explosion

Back in 1912 one of the most violent volcanic eruptions in recorded history shook Alaska. Seven cubic miles of rock and ash spewed out of the earth in 60 hours, nearly burying the city of Kodiak 100 miles away. So great was the destruction that a scientific expedition couldn't enter the area until 1916. At that time scientists decided that Mt. Katmai had blown its top. Recently Dr. G. H. Curtis and Jack Sheehan, two geologists of the University of California, measured the thickness of volcanic ash throughout the valley. They have come to the conclusion that a nearby volcano, Mt. Novarupta, was the real villain, and that the violence of its explosion caused the top of Mt. Katmai to cave in from shock.

POPULAR MECHANICS

The startling facts about the new Lennox Stowaway Air Conditioner, a scientific development that offers you...

Air conditioning throughout your home for cigarette money!

Out in Iowa corn country, where summers really get hot, farsighted designers and engineers of Lennox Industries have tested

and perfected a brand-new kind of low-cost, central air conditioning. Called the Lennox Stowaway Air Conditioner, it is so compact that it can be "stowed away" in an attic, basement, or crawl space; placed on a roof or outside of a home—yet so great is its capacity that it can cool off every room in an average-size home. It's easily installed in any home, but is particularly adaptable to one with a forced warm air heating system, because it can then use the same ducts and registers.

And the cost of this new air conditioner over the years you'll enjoy it? No more than you pay for cigarettes, even if your family smokes as little as two packs a day!

Here is the most significant development in home comfort since Lennox pioneered and perfected forced warm air heating. Now, millions of middle-income families can enjoy pleasantly cool, humidity-controlled homes throughout the summer. Lennox has been developing methods of conditioning air since 1895, until it now offers the most complete line of central air conditioning and warm air heating equipment in the world.

Because of its remarkable design, the new Lennox Stowaway Air Conditioner is almost unbelievably quiet, and surprisingly economical to operate and maintain. Air-cooled, it requires no plumbing or water tower; uses

less power than any similar type of equipment. Its big condenser is one-third larger than those found in other makes. Refrigeration circuits are 100%

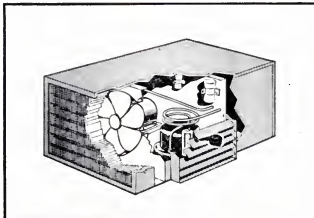
hermetically sealed for life—just as in a kitchen refrigerator.

A new air-handling device called the Power Prop (it's another Lennox exclusive) delivers up to 25% more condenser air at 10% less cost than ordinary. Six overlapping balanced steel blades move floods of air quietly,

smoothly—with never a trace of vibration. Two compressors assure a constant, comfortable temperature, properly balanced with humidity, even in 100° weather. One runs continuously for normal cooling, the other is on call for extra-hot days and nights.

Another performance-plus results from Lennox Pull-Through Design—still another Lennox exclusive. Air is "pulled through" the condenser coil, which acts as a highly efficient rain trap, preventing water from entering the compressor chamber and damaging electrical parts. Deep, overlapping exhaust louvers are also rainproof.

No matter what type of heating equipment you now have, your Lennox dealer-expert can bring you whole-house cooling with the Lennox Stowaway Air Conditioner, available in two-ton, three-ton, and six-ton sizes—all on the Lennox Easy Pay Plan. Look for your Lennox dealer in the yellow pages of your phone directory or write Lennox for more details and application suggestions.



More families buy LENNOX, through 5,606 home comfort specialists



Lennox Industries Inc., heating and air conditioning, founded 1895; Marshalltown and Des Moines, Ia.; Syracuse, N.Y.; Columbus, O.; Ft. Worth, Texas; Los Angeles, Calif.; Salt Lake City, Utah; Decatur, Ga. In Canada: Toronto, Montreal, Calgary.

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Advertisement

Sound your Z...enjoy

GAS ECONOMY FOR KEEPS

because—

Pennzoil with Z-7
keeps engines clean

Can motor oil really increase gasoline mileage? Yes! Pennzoil with Z-7 prevents deposits from forming in combustion chambers. This eliminates power-stealing knock and ping. By keeping engines clean, this different Pennsylvania motor oil with an all-oil body makes every drop of fuel work harder, unlocks full horsepower—not for just a few miles after an oil change, but for keeps. To make the gasoline you use take you farther on every tankful, get Pennzoil with Z-7, The Tough Film® oil, in the exact seasonal grade for your car!



IN EVERY STATE,
AT DEALERS WHO
care FOR YOUR CAR

MEMBER PENN. GRADE CRUDE OIL ASSN. PERMIT NO. 2, OIL CITY, PA.

Owners Praise Cadillac Performance

(Continued from page 108)

Ownership of a Cadillac does have social significance. It is a mark of success, like a mink coat. Who then are these Cadillac owners?

Nearly half of them are businessmen who either own their own business or are top-level executives in corporations (48.3 percent are in this category). Amazing as it may seem, the second most popular category (10.7 percent) is made up of retired persons. Third most popular occupation group includes doctors and dentists (9.0 percent). Farmers and ranchers are next with 6.7 percent to tie the salesmen with the same percentage. Lawyers account for only 2.0 percent of the owners.

More Best-Liked Features

Fourth on the list of best-liked features is exterior styling with 21.0 percent mentioning it. After this in order are the new transmission (8.3 percent), the low depreciation (7.0 percent), power brakes (7.0 percent), prestige (6.7 percent), roadability (5.0 percent), economy of operation (4.7 percent) and quietness (4.0 percent).

The following quotations describe these and other best-liked features and are listed in order of frequency of mention:

"Cadillac never has made extreme changes in styling to outdate current models."—Iowa housewife.

"People turn and look at it all the time."—California grape grower.

"Massive appearance."—West Virginia owner.

"I like the improved transmission, but it still has a small jerk."—Georgia retired owner.

"Higher used-car value than any other car."—California vice-president.

"Best buy due to its high resale value."—Idaho contractor.

"I have always sold my Cadillacs to someone other than the dealer. You can make a better deal with no trade-in."—California contractor.

"I buy outright and always sell my used car myself and never have any trouble disposing of it."—New Hampshire community official.

"Power brakes are good."—Florida owner.

"No car seems to rate the respect that Cadillac does. It is a constant source of amazement to me. People always seem to be impressed by the magic word 'Cadillac.' I believe it impresses me, too."—Texas grocer's wife.

(Continued to page 252)

FIRST

any way you look at it !



Awarded
Fashion Academy
Gold Medal 1956

Features of
Mercury
motors are
protected by
issued or
pending
patents.

KIEKHAEFER **MERCURY** mark 55E

40 h.p. 4 Cylinder in Line, Alternate Firing
Thunderbolt Engine; Reverse Gear and Neutral;
Dyna-Float Suspension; Scientific Engine
Silencing; Merchromatic 2-Tone Colors

FIRST with color styling. **FIRST** in power. **FIRST**
in durability and reliability. **FIRST** in actual
operating economy. **FIRST** with 12-volt elec-
trical system. **FIRST** with permanent magnet
generator. **FIRST** with super light weight starter.
FIRST with aircraft alternate four integral
magneto. **FIRST** with drop forged aluminum
clamp and swivel brackets (unbreakable).
FIRST with drop forged aluminum pistons.
FIRST with rubber rotor water pump. **FIRST**
with Ride-Guide steering. **FIRST** alternate firing
four. And many others.

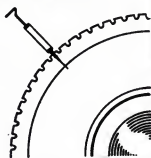
Write for **FREE** Illustrated Catalog

© 1956 KIEKHAEFER CORPORATION, Fond du Lac, Wisconsin

AMAZING TUBELESS AND TUBE-TYPE TIRE REPAIR SYSTEM ANNOUNCED!

REPAIR YOUR OWN TUBE
OR TUBELESS-TYPE TIRES
IN 5 MIN. *Without Removing
WHEEL OR TIRE!*

Tyron's pure latex
compound when in-
serted in puncture
forms a sealant and
lubricant for —



PLUG

Tyron's exclusive 2-
stop rubber plug.
When plug is inserted
in puncture hole ac-
cording to directions
form-fits, insuring a
lifetime repair.

TUBE-TYPE TIRE REPAIR

The use of Tyron's pure latex rubber
compound alone will repair tube-
type tires without removing the tube.
Shown at left: Lifetime patch made
with Tyron pure latex compound.

PLUS...

Truck Tire Repair
Bicycle Tire Repair
Motorcycle Tire Repair
Tractor and Farm Implements

Automotive Kit TMK-2 . . \$1.98

TYRON CORPORATION, Goodland, Kansas

Dear Sirs: Please send me additional information
about this amazing tire repair system.

For Tubeless Tires ☐ For Conventional Tires ☐

NAME

ADDRESS

CITY STATE

"Let's face it: I like it because it's a
Cadillac—America's most wanted auto-
mobile."—California contractor.

"A fine road car."—Ohio mortician.

"Doesn't break loose in hard cornering."

—New York executive.

"I like the way it holds the road because
of its extra weight."—Vermont housewife.

It doesn't seem to make much economic
sense, but Cadillac owners generally brag
about low operating costs.

"Once the initial cost is paid there is no
constant repair bill."—Virginia housewife.

1956 CADILLAC SPECIFICATIONS

ENGINE

Type 8-cyl., V-type, OHV
Bore and stroke 4.000 x 3.625 in.
Piston displacement 365 cu. in.
Compression ratio 9.75:1
Brake horsepower 285 at 4600 r.p.m.
(Eldorado—305 at 4700
r.p.m.)

GENERAL

Shipping weight (4-dr. 4430 lb. (62 sedan)
sedan unladen) 4665 lb. (Eldorado)
Steering ratio (over-all) 19.5:1 (Power steering
standard)

Steering wheel,
lock-to-lock 4.0
Turn-circle diameter 43.4 ft.
Brakes Conventional hydraulic
Wheelbase 129 in.
(133 in. on 60 Special;
149.75 in. on 75)

Height over-all
(unladen) 62.0 in.
Width over-all 80.0 in.
Length over-all 214.9 in. (62 Sedan)
(222.2 in.—Eldorado)

Minimum road clearance. .61 in.

CAPACITIES

Oil 6 qt. inc. filter
Water with heater 19.5 qt.
Gasoline 20 gal.

INTERIOR DIMENSIONS

Front-seat width 64.3 in.
Rear-seat width 65.2 in.
Headroom, front 35.8 in.
Headroom, rear 35.1 in.
Legroom, front 43.3 in.
Legroom, rear 46.3 in.

"Inexpensive to operate."—Vermont live-
stock dealer.

"The model '75' should be kept about four
years. In this way it makes an excellent
family car and costs no more than the aver-
age car to own."—California dentist.

But there is an occasional owner who
disputes this claim:

"I estimate depreciation at 10 cents per
mile or \$1000 a year."—New Jersey banker.

Few owners seem to keep their Cadillacs
very long. Almost one third traded in 1955
models to buy the 1956 car. Almost another
third traded in 1954 models.

Here are more favorable quotations:

"Motor runs quietest of any new car I

(Continued to page 254)



Just wipe on, wipe off!

One step cleans, polishes your car with new Simoniz Bodysheen. Special offer! Get \$1.19 value Red Top Eveready Flashlight free of extra charge with purchase of Bodysheen. Get details at store. (077113)...\$1.49



New Wizard Fuel Pumps, guaranteed original equipment quality. Precision machined parts; fully tested. Top quality diaphragm for long life. All popular cars. Single action pumps. (07202-50) From **\$2.49** Dble. action (07303-35)...From **\$7.59**



ALDOR

BRAIN-LIKE
THERMOSTATIC
REACTOR
DISK



Guaranteed to fire in oil!

Thermostatic control automatically adjusts spark gap for peak efficiency and performance at any heat range. Ideal for modern high compression engines and premium higher octane fuels. In sets. (01320-0) **95c** ea.



"Spring Condition" Your Car

with top quality parts and accessories from

Western Auto
STORES AND ASSOCIATE STORES



Repair your brakes, quickly, easily—with Wizard Master and Wheel Cylinder Kits. Includes live rubber cups, boots, pistons, springs, etc. For most cars, trucks. Master Cyl. Kits, with piston (055750-80)...From **98c** Wheel Cyl. Kits (05590-41)...From **37c**



New Wind Silencer, clamps on front door edge...breaks up air flow, carries it away from car body. No more wind "roar" even with windows down! Chrome-plated, lustrous finish. Easily installed. Fits most cars. (01390)...Pair **\$2.25**



Non-slip, non-stretch, cool running! Top quality Wizard Fan Belts are guaranteed to fit. Inner core of endless rubber impregnated rayon cords. Tough rubber cushion assures efficient, peak performance. Carry a spare! (79100)...From **98c**

NOTE: In some areas of the U.S., Hawaii, Alaska, and Mexico, prices slightly higher. Western Auto Associate Dealers own their stores, set their own prices, terms and conditions. (79442)



Money-saving warning from **Purolator**

It's oil filter check time—now!

Save costly engine repairs! With your Spring oil change, ask for a FREE OIL FILTER CHECK!

A dirty, choked-up old oil filter can't protect your new summer-weight oil! So, ask your serviceman to check it *before* he puts in that new oil! If you need a new refill . . . insist on a genuine Purolator Refill.

The Purolator Micronic is up to 10 times more efficient than many oil filters . . . stops grit as tiny as 39 millionths of an inch! There's one engineered specifically for *your car*. Refills installed in minutes. Cost as little as \$1.60.

© 1956, Purolator Products, Inc., Rahway, N. J.; Toronto, Canada.

"Purolator" and "Micronic" Reg. U. S. Pat. Off.

Proved best for every make of car

PurOlator

OIL FILTERS

ever bought."—North Carolina contractor.

"I like because it is heavy and I feel safe in it."—California housewife.

"Superb workmanship gives me such an extremely confident feeling."—North Carolina housewife.

"I like the remote control of the outside rear-view mirror."—California serviceman.

"It has the best motor ever put together."—Nevada bartender.

"Autronic Eye is important. I wouldn't consider a car without it."—Massachusetts retired owner.

"People think more of you in a Cadillac."—Florida merchant.

And More Complaints

The 1956 Cadillac apparently is thirstier than previous models and 10.7 percent of the owners complain about low gas mileage when compared with that of their previous Cadillacs.

"This year's car uses much more gas than the other Cads I have had since 1946."—California rancher.

"Should be less emphasis on horsepower, which our highways will not let us use, and more on gasoline mileage."—Washington merchant.

Next on the complaint list is engine trouble of various kinds. Most of the complaints in this category are minor.

"Noise in the motor. Sounds like a connecting-rod bearing."—Oklahoma owner.

"Serious ping and oil leaks."—California retired owner.

Other common complaints (in order of frequency of mention) are poor dealer service (7.0 percent), improper door fits (6.0 percent), power-steering trouble (5.7 percent), sloppy interior work (4.7 percent) and brake troubles (4.3 percent).

The following quotations describe these (and other) complaints and are listed in order of frequency of mention:

"Service no good at my dealer's. They say they are going to fix it, but I always get the car back with the same trouble."—New York businessman.

"Cadillac owners deserve better treatment than most dealers give them. You don't get the same treatment from the bus lines as you do from the airlines."—Florida realtor.

"Doors fit very poorly."—New York distributor.

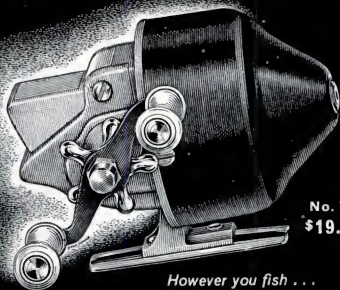
"Power steering noisy at end of stroke and too sensitive. Would prefer standard steering."—Connecticut engineer.

"Power steering too sensitive. Wanders at speeds over 55."—Idaho retired owner.

(Continued to page 256)

New Bronson Spin-King

... the only reel that
CAN'T TWIST LINE!



No. 700
\$19.95

However you fish ...
spin, fly or bait cast ...
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• In salt or fresh water—in calm or rough seas—this boat handles equally well. From Maine to Florida, sportsmen say it's dependable in all kinds of weather. Its high bows and staunch construction make it ideal for family use. Built to carry outboard motors of 2½ to 16 H.P.

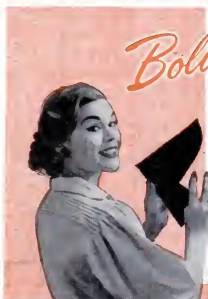
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Beautiful, washable Bolta-Wall vinyl tile is stain and scuff resistant... the perfect worry-free wall covering for all the busy areas in your home. The pre-pasted adhesive backing makes it "postage-stamp-easy" to install... no messy pastes, just wet the back and stick it on! Bolta-Wall tile is available in rich Mahogany or Bamboo patterns, both in colors that work beautifully with all decors.

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IN KITCHENS



IN LIVING ROOMS



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"Interiors should be of better quality."—California salesman.

"Brakes must be improved for weight and power of car."—California housewife.

"Poor brake linings. Too-low friction. Being in brake-supply business I know the trouble."—New York brake supplier.

"Has an extreme valve noise at about 7 miles per hour. Dealer said this was in all 1956 models."—California restaurateur.

"Poor paint job. Worst of any car I have owned."—Iowa farmer.

"Rust on rear bumper at 1000 miles."—New York veterinarian.

"Windows too hard to turn."—California wholesaler.

"Water leaks both sides."—California realtor.

"Difficult to fill gas tank. Station operators complain about inlet."—California contractor.

"Don't like exhaust-outlet locations. Deposits carbon on fender and bumper and I wipe it off with my clothing every time I walk past the car in the garage."—Kansas merchant.

"Trade-in allowance too low. I received \$300 more in cash than the Cadillac dealer was willing to pay by their book in trade."—Michigan businessman.

Design Changes

In every survey we ask the owners to tell us what should be changed in their new cars. A large number of Cadillac owners say no changes are necessary (39.0 percent). The car is all right as it is. The most frequently mentioned changes cover the same areas as the complaints: more careful assembly; improve the transmission; better gas mileage.

The following suggestions are interesting enough to warrant quotation:

"Should be possible to shut off the front heater vents and throw all the heat to the rear seat."—Georgia sales manager.

"Driver's ash tray should be on the left."—California housewife.

"Should have electric windshield wipers."—California truck operator.

"Instrument panel really needs changing."—Mississippi retired owner.

"Front seat on two-door models should have separate controls so the passenger does not have to sit in the position the driver does."—Arkansas contractor.

"Move window-lift control panel on driver's side upward so my left leg won't keep operating the power windows."—Mississippi merchant.

"Install better heater-temperature control."—Texas builder.

(Continued to page 258)

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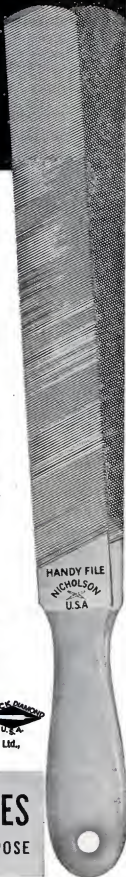
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Over 250,000 boat owners have covered their boats this easy way! How about you? For covering materials, just ask your local marine dealer. Or, for step-by-step information, write me for our special Fiberglas boat-covering booklet and a list of kit manufacturers. Charlie M, Dept. 178D, Essex, Conn.



OWENS-CORNING
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*T-M. (Reg. U S. Pat. Off.) O-C, F. Corp.

Styling Not Vital

More than half of the Cadillac owners say that exterior styling did not play an important part in their choice of the car. There's more to Cadillac's appeal than its appearance, obviously.

Only a small percentage (10.4 percent) object to the fact that the 1956 Cadillac is only slightly different in appearance from the 1955 Cadillac. In fact, most of them seem to like this unchanging nature of the car.

"I figure to sacrifice some style for low depreciation."—California businessman.

"I like Cadillac because of quality not styling. Mine was bought before seeing one or even a picture of one."—Ohio broker.

"Whatever changes Cadillac makes will be good. I ordered my 1956 Cadillac in January 1955."—Idaho lumberman.

"Styling not important to me. The only reason for trading was that my wife wanted a blue car."—California vineyard owner.

"I bought it for anticipated performance and service, not to 'four flush' for looks."—Oklahoma oil producer.

"Purchased car to please myself and not style-conscious public."—Massachusetts lawyer.

"I buy every two years regardless of styling."—Idaho motel owner.

There you have the owners' views of the 1956 Cadillac. They tell how their cars behave in everyday usage. Turn back to page 105 for Floyd Clymer's driving test and to page 106 for Dale Kelly's engineering report on performance. ★ ★ ★

Clymer Road Tests the Cadillac

(Continued from page 105)

tread and further because of good shock absorbers. One soon becomes accustomed to this rather "soft" suspension system and the somewhat excessive movement of the steering wheel, which requires more movement than the faster and more direct steering of foreign and sports-type cars. Cad's overall steering ratio is 19.5 to 1, resulting in considerable "winding" of the wheel, which requires four turns from lock to lock.

The car handled well and loafed along at 90 to 100 miles per hour with effortless ease. It is fast and furious and top speedometer reading was 120 miles per hour. However, like all modern speedometers, it was on the high side by about eight percent. The car used no oil. Cadillac mileage is okay in my book.

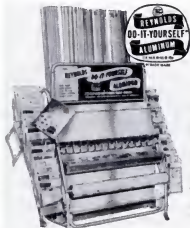
The Hydra-Matic has been improved for 1956. This has made for much smoother shifting than on former models, and yet

(Continued to page 260)

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You start with Reynolds **Do-It-Yourself** Aluminum screen sections. Then—**ONE**—you measure and cut—**TWO**—you snap the frames together—**THREE**—you put in screen cloth. And, honestly, you can make all the screens for your house in a single weekend. To put it another way—it's quick and it's easy! Best of all you'll have screens that are light weight, rust and warp-proof... ready for

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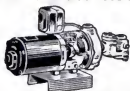
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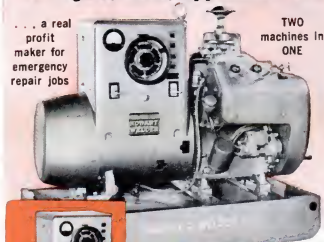
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Welder's
Vest Pocket
Guide

there is no mushiness or feeling of slippage as in some other makes of automatic transmissions. Hydra-Matic positive drive contributes to efficiency and performance without illusion of slippage. It engages immediately and with no fuss. There are two Drive ranges and a Low range and Reverse with, of course, the desirable kickdown feature.

Power brakes are standard equipment with the master brake cylinder and vacuum power cylinder in a unit. I found the brakes satisfactory, with light pedal pressure required, but there was some fading when decreasing from high speeds or in constant brake use on winding roads. Even though I beat the test car over all kinds of terrain, not a squeak or rattle developed and I was in almost a deluge of rain and found no water leaks. Vision in the rain is improved by a new vacuum-type windshield wiper. A second action which allows rapid, narrow-angle strokes has been added to the normal variable-speed adjustment—a fine idea. Cadillac assembly is better than it was a few years ago, and it always has been quite good. There is very little body noise or disturbing rumble even at high speeds. In a strong three-quarter wind in the desert there was a noticeable "wind wander."

The instrument panel is massive and instruments are well-located. Speedometer vision is excellent and I like the indicator gauges instead of the warning lights now popular on many makes. The hood is long and quite high and the operator has a feeling of driving a massive automobile which, of course, is true. Vision in every direction is good.

The ventilating system is extremely effective, permitting abundant fresh air to enter, and the heater is one of the best I have ever found in any automobile. Fresh air is taken in through a slot below the windshield.

The wide brake pedal, which is now lower than formerly, is better located in relation to the throttle than on previous models and can be operated more easily with either foot. The emergency hand-brake lever is well-located and easy to operate. I found the radio reception extremely good, even in the desert, which is quite a test of efficiency of any radio.

The interior finish is of excellent quality, as are the seat cushions and all appointments, which of course one has learned to expect from Cadillac. The electric windows and seat adjustment worked to perfection and the doors have a solid feel in opening or closing. The seating position is good and the driving comfort of the car for long-

(Continued to page 262)

It's Great!

Nothing like being out on water with your fishing pal — especially when you're in an Arkansas Traveler. It's Everything That Makes a Boat Great! Fast!—Maneuverable!—Rugged!—Seaworthy!—Stable!—Trim! Write today for literature on the 18 great new Arkansas Traveler models for 1956.

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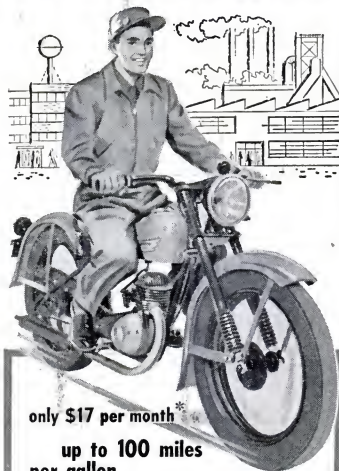
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distance travel is tops. One can drive long distances with little fatigue and in luxurious comfort. A new six-way power seat adjuster provides for adjusting the angle of the seat back, in addition to the horizontal and vertical movement, and the horizontal adjustment is increased to five inches.

The large taillights mounted high on the rear fender tips are a safety feature and an excellent guide in backing out of driveways or in parking. The gas filler cap is located under the hinged left taillight, which is convenient and out of the way. Two reverse-flow mufflers and straight-through resonators are used. The rear twin exhaust pipes project out of both sides of the massive rear bumper. The arrangement is a neat one. However, soot and dirt do accumulate around the hole edges where the exhaust is emitted. Just watch your step around parking lots or your garage so that you don't brush against one, as the stain you'll get by touching it isn't easy to remove from clothing.

The front grille is massive. Cadillac engineers have done the best job in the industry of producing impractical bumpers. The bulletlike bumper extensions extend far forward and are the first part of the car to touch another car. It is the most impractical built when it comes to pushing a stalled car. No one is happy about pushing another car, but at times it is necessary. Cadillac's design has made it almost certain that no Cadillac owner is going to push another car without damaging the front end of the Cad or the rear end of the other car. Bumpers that are practical and that may be used in pushing another car should be required by law on all cars and the points where any bumper touches another bumper should be standardized.

The hood is counterbalanced, as is the trunk lid; both open and close easily. There is large rear compartment for luggage.

Certainly Cadillac for 1956 offers many worthwhile improvements over former models. Cadillac's traditional quality in both material and workmanship is noticeable. For over 50 years Cadillac has built quality products with very few models that could ever be classed as poor ones. It is a remarkable tribute to this company that year after year they have maintained their position and reputation. Many feel it is the best of any mass-produced car. ★ ★ ★

COMING NEXT MONTH: PLYMOUTH

Be sure to get your copy of *Popular Mechanics* next month when the owners, Floyd Clymer and Dale Kelly will tell you all about the 1956 Plymouth. It's on the newsstands April 26.

Now You Can Own A Basic Home Workshop for Only

\$49⁹⁵

Not Just a Drill with Kit of Attachments, but Two Separate SKIL Power Tools!

- SKIL 4 1/4" Power Saw
- SKIL 1/4" Power Drill
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Genuine SKIL Power Tools save you money on home repair and improvements . . . equip you for a hundred workshop and household jobs. The SKIL JACK-OF-ALL-KITS is a \$58.85 value for only \$49.95!

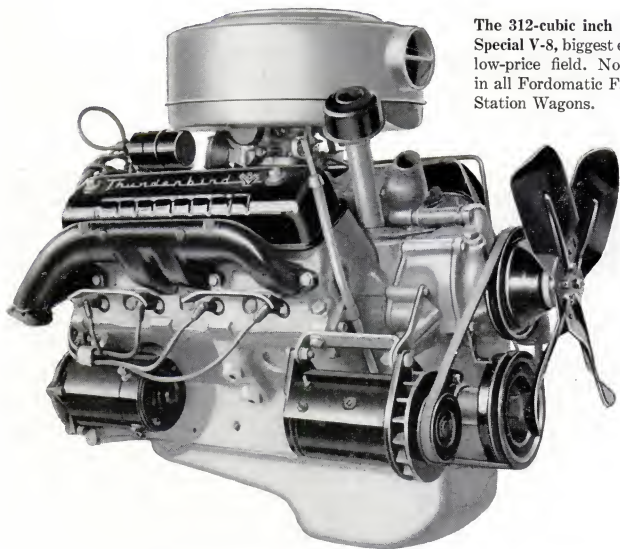
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How FORD has upped V-8 h.p.

The 312-cubic inch Thunderbird Special V-8, biggest engine in the low-price field. Now available in all Fordomatic Fairlanes and Station Wagons.



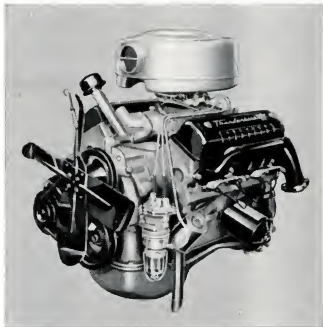
The world's leading maker
of V-8's now offers up to **225 h.p.**

There is good news from Detroit for the man who appreciates the exciting feel of a lot of "horses" under the hood of his family automobile.

The management at Ford announced recently that its Thunderbird *Special* V-8, the job that revs up 225 h.p. and powers the mighty Fordomatic Thunderbird, now is available in Fairlane and Station Wagon models with Fordomatic Drive. This is the *biggest* engine in the entire low-price field with a displacement of 312 cubic inches! And it's number *one* in *torque*, too, which means you get top performance—for the kind of driving *you* do.

The standard V-8 engine for Fairlane and Station Wagon models already is the most powerful *standard* "eight" in the low-price field. It's the Thunderbird V-8 that develops 202 h.p. with Fordomatic. This is up to 32 *more* horsepower than other standard V-8's in Ford's field. What's more, this same engine has been made available in all Customline and Mainline model Fords, too.

What all of these power boosts amount to was perhaps best expressed by the automobile mechanic who, upon hearing of these new Ford engines said, "Looks to me like Ford means to stay Number *One* on the 'Git' Parade!"



The 292-cubic inch Thunderbird V-8, the standard eight for all Fairlanes and Station Wagons, is now available in all Customline and Mainline models, too. Has 4-barrel carburetor, dual exhausts.



The 272-cubic inch Ford V-8, the standard eight for all Customline and Mainline Fords. Has modern dual carburetor, automatic choke, single exhaust.

FORD Division of FORD MOTOR COMPANY



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TO FILL ANY
SPINNING
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 Quickly...
 without twist!

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Dependable, uniform spinning monofilament for ANY spinning reel. Sensationally soft and manageable, No. 5400 is "limp as an old shoelace". Especially processed by Shakespeare line specialists from DuPont Tynex Nylon... for finest Shakespeare spinning reels when filled with line at factory.

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Free! NEW 1956 "TIPS & TACKLE"

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Please send, FREE, new 1956 "TIPS and TACKLE" booklets and Joe Godfrey pocket fishing calendar.

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Seabees Build Town Under Ice

(Continued from page 94)

Frank Jorgenson, aerological officer; Dick Bowers, in charge of construction operations; Dave Baker, communications officer. Rank and title meant nothing. Plumbers became carpenters, carpenters drove tractors, cooks piled cargo in the supply dump. Lieutenant Kanodler, Seabee dentist, found himself cargo master one night directing the unloading of mammoth 10-ton snow compactors. Canham hitched seven-ton yokes of steel bobsleds to tractors himself, rode beside "Cat" skimmers bringing heavy equipment over hazardous trails and helped dig out bogged sleds.

Over at Little America, Lt. Dan Slosser, Seabee executive officer; Lt. Don Mehaffey and chief warrant officers Vic Young and George Purinton pitched in the same way.

Polar Training in Summer Heat

Last summer, when the mercury crowded 90 in Davisville, R. I., this team rehearsed every phase of its upcoming job like a football squad in spring training. "We went through daily polar survival routines," says Vic Young. "Six-man teams worked out hauling one-ton sleds on dry ground. The specially designed electrical and plumbing equipment was torn apart and reassembled for practice. Immersion heaters to melt snow for water were tried out. On kitchen equipment they'd be using, cooks prepared a full meal of polar rations and we ate it."

Meanwhile, out in Detroit Arsenal's cold room, 15-man crews in full polar regalia under Dick Bowers practiced assembling one of the 20 by 48-foot prefab buildings while temperature was lowered to minus 90 degrees, and a 12-knot wind was fanned through the cell. "Under normal conditions," Bowers recalls, "one group could erect a complete shell in three hours. In the refrigerator, the job took eight hours. It gave us a hint of what we'd face when we got to Antarctica."

Antarctica Unpredictable

Unfortunately, Antarctica has a hatful of dirty tricks that can't be synthesized in cold rooms and MCB Special ran afoul of most before they finished. First, they had to get there with 18,000 tons of equipment and supplies. That's enough to make a solid pile of material about a city block square and two stories high. The white continent is ringed by a narrow band of open water so cold (about 28 degrees) that an unprotected man falling in is dead within eight minutes. North of this lies the ice pack. Broken from the frozen bays and swept

(Continued to page 268)

Glidden Announces . . .

New GLID-TONE products specially made for do-it-yourself wood finishing



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Furniture Refinishing



Interior and Exterior Paneling



Pleasure Boats

Wood Hobby Products



Antiques



Picnic Tables, Benches, Lawn Furniture



Now Glidden takes the "mystery" out of wood finishing, staining. The new array of Glid-Tone products have "built-in" features for amateur use; give *professional results*. Look for the Glid-Tone label at your paint store.

New, easy-to-use stains in color! Use *Glid-Tone Stains* either inside or out. Seals, does not raise grain. Extremely easy to use—just wipe or brush on, wipe off!

For high gloss and highest resistance to alcohol, acid, heat and abrasion, use all-purpose *Glid-Tone Gloss Varnish* . . . for floors, furniture, table tops, bars, cabinets!

For exterior trim, paneling, boats and marine uses—*Glid-Tone Spar Varnish* is extremely tough, withstands effects of water, salt spray, heat, sun, cold.

For modern, hand-rubbed effects without laborious rubbing, use *Glid-Tone Satin Sheen Varnish*. Self-priming. No thinners or other extras required.

Glid-Strip—a safe, effective paint and varnish remover. Lets you work larger areas because it stays wet longer. Non-flammable. Cleans up with water!

Glid-Tone Natural Wood Filler—for filling open-grained woods . . . oak, chestnut, walnut, mahogany, pine, fir, redwood.

Glid-Tone Crystalac—an all-purpose, crystal-clear brushing lacquer coat for beautifully grained light woods. Dries in only 20 minutes, provides lasting protection. Non-yellowing.



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Plans Available; See your lumber dealer

or write (USA Only) Douglas Fir Plywood Association, Tacoma 2, Wash., Dept. 9. Please order plans by name, enclose 10c for each.

outward by winds, it circles the land like a halo 50 to 500 miles wide. Ships nosing into it risk crumpling their hulls like tissue in the pressure of wind-driven flocs and towering million-ton icebergs.

The Seabees and their mountain of gear rode a seven-ship fleet through the pack in channels carved by three powerful ice-breakers (*Popular Mechanics*, March 1956). Even with open highways to follow, the tanker *Nespelen* tangled with an ice "cube" and tore great chunks from her propeller blades, slowing her to half speed.

Ships Tie Up to Ice

Ships never get close enough to real land for mooring in Antarctica. Sea ice up to 15 feet thick covers bays and inlets until late in the season. So crews must chisel holes in the ice and freeze "deadmen" into them. Ships tie up to these at the ice edge. Then the fun begins. Supplies must be unloaded and hauled on sled trains across bay ice and up natural snow ramps to building sites on land or atop towering ice cliffs of the continental barrier.

In the old days, with dog sleds that rode lightly across the snow, moving a small expedition ashore was little trouble. But a cargo of five complete towns, some of which come in 50-ton packages, takes more than Siberian huskies to haul it. To make matters worse, the entire continent is buried in neve—Antarctica's special brand of snow. It has the consistency of granulated sugar. Normal tractors grind themselves cab-deep in it within minutes. As an experiment, Herb Whitney brought along a squat, heavy-set tracked vehicle called an "Ontos" (Greek for "the thing"), hoping it would prove a good reconnaissance buggy. The heavily armored cross between Jeep and tank got 50 feet from shipside and promptly dug its own grave in the snow. Balloon-tired forklifts met the same fate. But MCB Special's tracked Army Weasels and spidery Snocats—with four sets of steerable tracks set on like outriggers—did yeoman service. With strings of one-ton sleds lashed behind to carry freight, they heaved over drifts like rowboats on a choppy swell. A ride in a Weasel larruping over rutted trail, somewhere between snow and sky, is like being caught in a washing-machine tumbler with no handholds. But it gets there.

35-Ton Tractors Do Heavy Work

Stout as they are, Weasels and Snocats could never have hauled half the freight for this expedition. Antarctica has never seen anything like the 10 monstrous 35-ton tractors that crawled up snow ramps at

(Continued to page 270)

NOW — A POWER WORKSHOP WITH REAL GUTS

at a price you
can afford!

Built around this

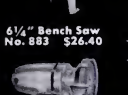
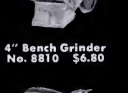
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	Portable Jig Saw No. 886 \$11.45 (with 4 blades)	
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	Bench Stand No. 881 \$3.40	
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two miles per hour, each tugging two gigantic 11-ton steel sleds with broad V-shaped runners. They hauled everything from fuel drums to complete knockdown buildings. Their giant five-foot-wide tracks act like snowshoes, exerting a pressure of only four pounds per square inch on the snow—barely more than a man on foot.

Sitting beside a Seabee Cat skinner in the heated, glassed-in cab of one of those 14 by 25-foot Juggernauts, winding over snow trails through a blizzard, is like looking at a Cinerama sequence of the antarctic in a movie theater during an earthquake. We rode down the barrier trail one midnight (in broad daylight) when a blinding snowstorm obliterated everything beyond the stack that jutted from the roaring 1200-revolutions-per-minute diesel power plant out front. The tractor's king-size grousers bit the snow hummocks and pitched us from one end of the cab to the other. Our train of giant bobsleds rumbled as they slid sideways on the crevasse-ridden snow ramp leading from ice cliffs down to Kainan Bay. To find the next trail flag, the bearded skinner throttled down and stepped out on the broad deck every few seconds, peering through the gale so we wouldn't wander off track and wind up in a 100-foot crevasse.

Ether Aids Minus-60 Starts

Proud of his charge, the Seabee kept praising its virtues. "She has an ether-aided starting system," he pointed out. "I can turn her up when the mercury drops to minus 60 this winter. The engine doesn't need to run to keep this heater going, either, so don't mind if we lose the trail and have to sweat out the storm." We heaved around a bend in the trail just in time to avoid mowing down a row of red flags marking a 100-foot-deep crevasse. "It's tough turning these outsize tracks just by braking one and spinning the other," the skinner explained. "So this baby gets an extra kick from a hydraulic drawbar that I can move sideways against the load and help boost her rear end around—sort of like the tail wagging the dog." He indicated the panel in the cab roof. "Escape hatch," he said, soberly. "If we should need it, the last one out is a dope."

There were few snow inclines these wide-tracked prime movers couldn't climb. When they did have trouble, the method of pulling them out was simple. The powerful winch on the trail of a second tractor, planted on the crest of the hill, was used to drag the bogged train out of its predicament.

At McMurdo, one tractor crept off the trail in a storm and crashed into a deep crevasse, wedged on its side. Dave Baker

(Continued to page 272)

Why grope your way like this in fog?



Get a pair of G-E *All-Weather* Headlamps... see better in any weather

NEW General Electric *All-Weather* Headlamps are so revolutionary they make all ordinary headlamps obsolete.

With ordinary headlamps, upward light is uncontrolled. This light is reflected back into your eyes by millions of tiny moisture particles—that is why seeing at night in fog, rain, or snow, is so difficult. New G-E *All-Weather* Headlamps have a special shield over the lower beam filament that blocks out uncontrolled upward

light. Kick-back glare is reduced to a minimum . . . you can see the road ahead more clearly.

On clear nights, the upper beam filament which is purposely not shielded, puts light farther down the road. You can see curves, dips and obstacles in time to slow down.

With a pair of G-E *All-Weather* Headlamps you get 25% more light. Passing oncoming cars is easier, too, because the light is concentrated where you need it—on the right-hand side of the road.

Replace your present headlamps with a pair of new G-E *All-Weather* headlamps. They can be quickly installed and accurately aimed for a surprisingly modest cost. Ask for them by name: G-E *All-Weather* Headlamps.

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G-E *All-Weather* Headlamps: G-E filament shield controls upward light, reduces kick-back glare, makes seeing easier.

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Build a room like this in your basement—or in any waste space. It's a cinch with Gold Bond Building Products . . . made to work together.

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had three skidders dig their Cats into the deep snow. Using these for deadmen, he rigged blocks and cable, and the juggernaut winched itself backward to solid snow, after a roped driver set gears turning and leaped off to safety. In general, however, those massive tracks kept the big machines afloat on the snow—over crevasses and all.

Even Deepfreeze's unique buildings must wear snowshoes to keep them from sinking in the neve. The structures sit on wooden platforms laid like ties under railroad tracks. The shells themselves are raised on projecting steel beams so escaping heat can't melt the snow beneath the underpinnings. Viewed from one end they look like grotesque splay-footed insects. The knockdown structures are made up of four-by-eight-foot panels with alternate tongued or grooved edges. Seabee work crews swarmed over foundations and slipped one panel against another to make floor, walls or roof. Each panel is a four-inch-thick sandwich of plywood stuffed with spun glass. Sheet aluminum, to reflect heat and light, lines the inside wall. Plasticized rubber joints seal cracks between panels, which then are clipped together instead of being nailed. "They were designed for speedy erection under worst possible conditions," Vic Young points out. "At minus 60 a man can only work an hour at a time since he inhales the frigid air faster than his body can warm his lungs." There's another reason for the clips. In sub-zero weather, nails or screws popped into a man's mouth will freeze to a man's tongue or lips, tearing flesh when pulled free.

Sites and Trails Established

Before MCB Special could even begin to drive sled trains or erect buildings, sites had to be picked and safe trails established. This job fell to Herb Whitney and Dr. Paul Siple, Deepfreeze's senior scientist. Siple is the strapping Boy Scout Byrd took with him on the 1928 expedition. He hasn't missed one since. Today, he is probably the world's outstanding expert on the make-up and movement of Antarctica's great ice-cap. Using helicopters, Weasels and finally skis, these men hit out across windswept wastes accompanied by small parties of men and bundles of red flags. They poked snow ahead of them with ski poles and stuck flags in safe snow as they went. At Little America, the route snaked six miles around pitfalls from ice edge to building site. At McMurdo it was 35 miles in to the black ridges or "nunataks"—hills swept clear of snow by polar winds.

One of the toughest problems in Antarctica is the ice that blankets it. The

(Continued to page 274)

U. S. DEPT. OF AGRICULTURE PERFECTS NEW GRASS THAT SMOTHERS CRABGRASS & STAYS GREEN DESPITE DROUGHT!



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At last a care-free lawn that stays lush green! AMAZON MEYER Z-52 ZOYSIA Grass thrives in hottest drought. Its deep root system (2 ft. or more) holds underground water. Goes weeks without rain or watering. Eliminates ugly brown or bare spots due to scorching heat.

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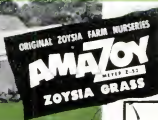
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endless glacial mass on which men travel and build their camps never stays put. Driven by the Gargantuan pressures of a two-mile-thick continental ice plateau, the edges of the mass constantly ooze outward like a flattening lump of silicone putty. Those edges form the continental-barrier ice cliffs fronting the polar sea. "It flows outward a quarter of a mile each year," explains Siple. "Great chunks calve off and float away as icebergs—some of them hundreds of square miles in area." One piece, 220 miles long and 15 miles wide broke off the Bay of Whales recently, taking a chunk of Little America IV with it.

The movement of continental ice, as it flows over great mountains and valleys deep beneath the surface, opens yawning crevasses that quickly bridge over with wind-blown snow creating death traps for men and machines. We climbed into some of those chasms at a hazardous spot that the Seabees dubbed "Crevasse Valley," near Little America. We found ourselves in a maze of blue grottoes stretching off to infinity and intersected by other great rents, reaching down to what seemed bottomless gloom. Any of them could have swallowed a big tractor train whole.

Trail Parties Needed Expert

Until recently, trail parties have depended entirely on a crevasse expert who walks ahead with a 14-foot probing rod that he spears into the snow to see if it's solid or hollow beneath. His sharp eyes pick up crevasse signs—snow-drainage areas where pressures heave up huge "haycocks" and crumble the thick icecap, or where Gargantuan tensions split it asunder. He looks for slight depressions or suspicious humps. Sometimes thin bands of snow slightly lighter or darker than surrounding snow tip him off to great voids beneath. In good weather he's almost infallible. But during blizzards or eerie polar whiteouts when all shadows blend into a solid sheet of white sky and snow, his experienced eyes are little better than the rankest amateur's.

This year, the Seabees brought along a strange-looking electronic crevasse detector developed by the Army Corps of Engineers at Ft. Belvoir. With it came Silas Bowling, chief warrant officer and technical advisor to Deepfreeze trail parties—a man with years of experience on the Greenland icecap. The detector, slung on a special "pathfinder" Weasel with built-in bunk and latest radio gear, consists of three metal plates in the form of toboggans, each about a yard square. One, sticking out front on a 20-foot nonconducting boom, bobs along the snow like a probing hand.

(Continued to page 276)



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(LICENSED MANUFACTURER)

FREE LITERATURE
DUNBAR MANUFACTURING CO., INC., 6604 Sylvan, Houston 23, Texas

Two others are dragged behind. An electrical field around these plates registers a constant voltage on a meter in the cab—as long as the snow is solid. But the minute that toboggan out front passes over a hidden pocket, the difference in conductivity between snow and thin air changes the electrical field, which is instantly registered by the needle in the cab. Bowling, heaving along in his odd rig, discovered eight hidden crevasses in five miles on the Little America trail. One was 100 feet deep. Another was 35 feet wide. Si dynamited each, and climbed inside to check firmness of the bottom so Seabees would know whether to bridge or fill it, for their ponderous sled trains to cross safely.

Flags Still Best Markers

So far, flags are the best means of keeping overland polar parties from wandering aimlessly across snow prairies and coming to grief. Stuck in frozen neve, flags stay put for years. On the first trip across Kainan Bay ice this year we found trail markers left by the Atka expedition more than a year ago. Flags can be seen for miles across antarctic ice in good weather. But when polar storms roar across snowfields, obscuring everything beyond 10 feet, a trail party is forced to stop and sweat it out until the flags become visible again.

That may be changed soon. Up on the barrier near Little America this year, Amory H. "Uncle Bud" Waite, electrical engineer for Army Signal Corps laboratories in Fort Monmouth, has been clanking around in another strange Weasel with a large, curious antenna perched on its roof. Inside is a complete radar set with swivel scope suspended above and forward of the driver's head. The entire unit weighs only 150 pounds. By using wire-mesh markers on poles instead of flags to mark trail, Waite can pick up the route by a series of blips on his scope in daylight or dark, fair weather or foul. Uncle Bud, who gets his informal name from the call signal he uses on radio transmissions, is a rugged antarctic veteran who, with a handful of men, went out over the barrier through the winter night to rescue Byrd from his fume-ridden advance-base shack in 1928. This year he and his sharp crew of young technicians ran tests with buried antennas that may some day see radio signals transmitted through Antarctica's top layer of icing, eliminating the polar problem of radio blackout. How Waite's system works will be discussed in a later issue.

Next month, further problems confronting the Seabee base builders will appear in Popular Mechanics.

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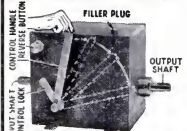
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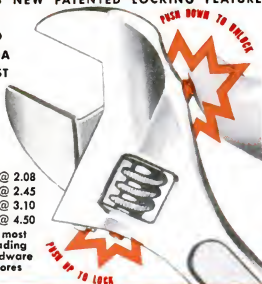
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APRIL 1956

281

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Sheep Jacket

Sheep in the Southwest are being decked out in zippered jackets that keep out dirt and result in better-quality fleece. A pleat in the front can be taken up so that the jacket can be worn after shearing in chilly spring weather. Ranchers say that the jackets have a side benefit: Nonplussed coyotes keep away from the strangely attired sheep.

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Equipped with sliding D-rings, a safety belt for children permits them to stand, sit or lie down on the seat of a car, and at the same time protects them from being thrown to the floor or through the windshield in the event of an accident. The belt can withstand a 150-pound pull without breaking.

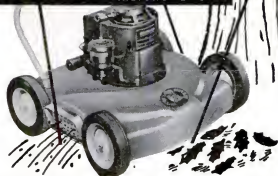


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SIDE TRIM Reduces Hand Trimming

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Bolens' power mowers have all the features that make lawn beauty care easy. Once over with a Bolens Rotary Mower leaves a carpet-like finish—no scalloping, no cuttings to rake. And you get a mulch that preserves moisture and protects against burnout. Write for free brochure.

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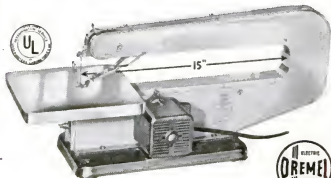
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The handiest man can't fix fixtures firmly — and permanently — in most of these materials; or turn old, loose screw holes (for hinges, for instance) into tight, new ones... unless, of course, he uses magic PHIL-PLUG, the amazing new compound that grips screws fast in TILE, PLASTER, BRICK, CEMENT and WOOD — instantly and permanently!



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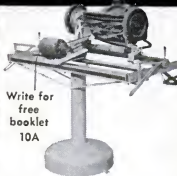


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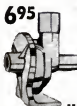


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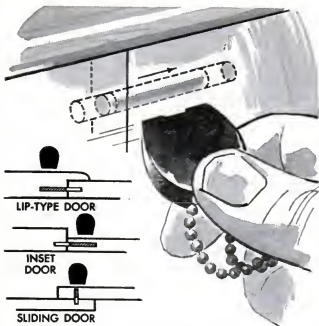


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For further information, write to THE DOW CHEMICAL COMPANY, Dept. S944E, Midland, Mich.

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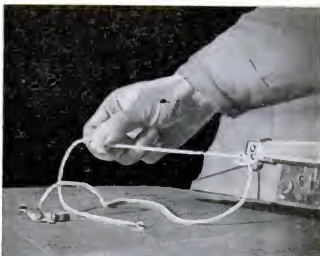


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Invisible because it has no keyhole, a new type of lock has a magnet for a key. The lock is installed by drilling $\frac{1}{4}$ -inch holes in the edge of the door and in the doorjamb and inserting the bolt. To slide the bolt open or closed, the magnetic key is held near the surface of the door and moved in the desired direction. The lock can be used on doors, cabinets or drawers.

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You can stretch a new electric wire to more than double its original length. When the wire is released it snaps back like a piece of rubber. The conductor is loosely braided from 21 strands of fine wire and is covered with woven rayon or nylon. The elastic wire is expected to be used in making connections on electric blankets, hair driers, hearing aids and TV sets. It is available in standard lengths of two, three and four feet, with various types of terminals.



WARNING !



Today's high-powered engines need frequent spark plug checks to prevent dilution of oil

Don't change to summer oil without a spark plug check!

If you haven't checked your plugs in the last 5000 miles, they may be misfiring—and will dilute your new oil with gasoline.

Do you realize that every time a spark plug misses, raw gasoline remains in the cylinder and drains into your crankcase? This thins the oil so it can't properly protect costly engine parts . . . and may put you in line for a big repair bill.

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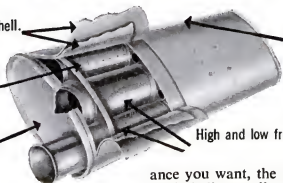
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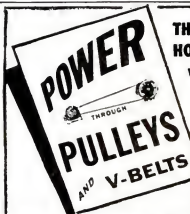
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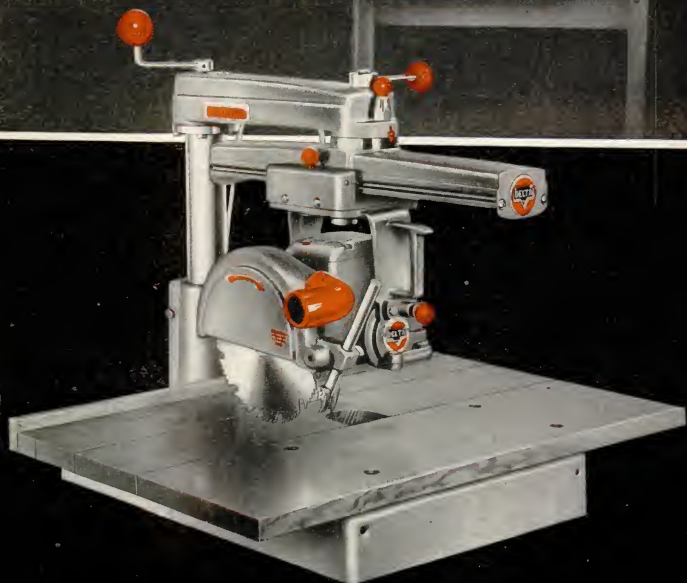
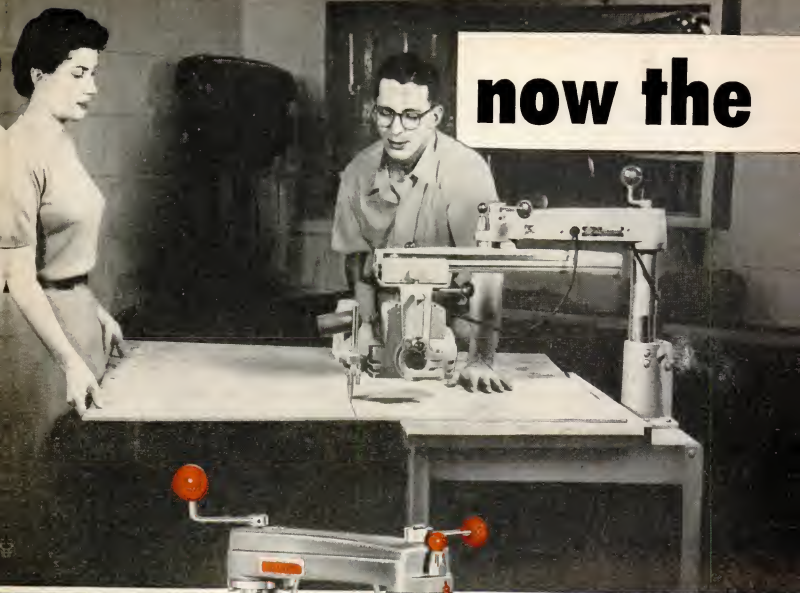


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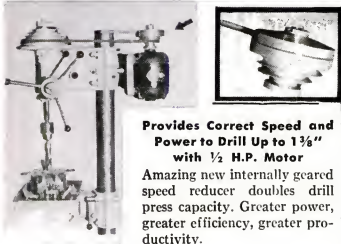
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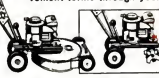
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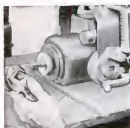
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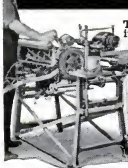
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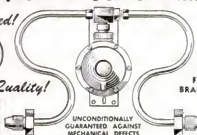


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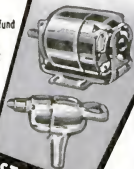
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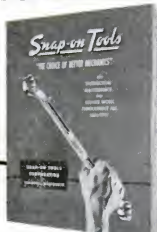
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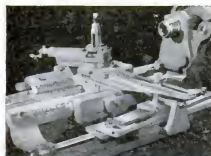


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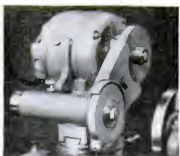
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